Electrical network protection

Sepam
IEC 61850 communication

For Sepam series 20/40/80

User's manual
10/2009

Schneider Electric

Safety instructions

Safety symbols and messages

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

ANSI symbol.

IEC symbol.

Risk of electric shock

The addition of either symbol to a “Danger” or “Warning” safety label on a device indicates that an electrical hazard exists, which will result in death or personal injury if the instructions are not followed.

Safety alert

This is the safety alert symbol. It is used to alert you to potential personal injury hazards and prompt you to consult the manual. Obey all safety instructions that follow this symbol in the manual to avoid possible injury or death.

Safety messages

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result** in death, serious injury or property damage.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **could result in** death, serious injury or property damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **could result in** minor or moderate injury or property damage.

CAUTION

CAUTION, used without the safety alerts symbol, indicates a potentially hazardous situation which, if not avoided, **could result in** property damage.

Important notes

Restricted liability

Electrical equipment should be serviced and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this manual. This document is not intended as an instruction manual for untrained persons.

Device operation

The user is responsible for checking that the rated characteristics of the device are suitable for its application. The user is responsible for reading and following the device’s operating and installation instructions before attempting to commission or maintain it. Failure to follow these instructions can affect device operation and constitute a hazard for people and property.

Protective grounding

The user is responsible for compliance with all the existing international and national electrical codes concerning protective grounding of any device.

Contents

Presentation **2**

Communication implementation steps **4**

ECI850 Sepam server **5**
Configuration 5
FTP server 13
Diagnostics pages 14
Commissioning and troubleshooting 18

ACE850 Communication interface **20**
Configuration 20
FTP server 24
Web server 25
Commissioning and troubleshooting 31

Configuration of IEC 61850 protocol **34**
Introduction 34
With SFT2841 setting and operating software 36
With SFT850 configuration software 43

Configuration of GOOSE communication **50**
GOOSE configuration process 50

Conformance statements **56**
ACSI conformance statement 57
MICS - Model implementation conformance statement 60
PICS - Protocol implementation conformance statement 90
PIXIT - Protocol implementation extra information for testing 93
TICS - Technical issues conformance statement 99

Presentation

General

IEC 61850 is a standard for communication networks and systems in substation. Sepam units can be connected to an IEC 61850 station bus by one of the following way:

- the ECI850 Sepam server, for Sepam series 20, Sepam series 40 and Sepam series 80,
- the ACE850 communication interface, for Sepam series 40 and Sepam series 80 only.

Sepam units with ECI850 and ACE850 are compliant with:

- IEC 61850-6
- IEC 61850-7-1
- IEC 61850-7-2
- IEC 61850-7-3
- IEC 61850-7-4
- IEC 61850-8-1

Application and benefits

Based on the Ethernet protocol, the IEC 61850 communication standard ensures:

- high communication speeds and versatile communication architectures
- interoperability between manufacturers

With ECI850 Sepam server

The ECI850 Sepam server provides a high-performance, cost-effective, and versatile solution for connecting Sepam units to an IEC 61850-compliant system.
This provides:

- compatibility with the whole Sepam range (series 20, 40 and 80) to fit your needs perfectly,
- ability to upgrade existing Sepam units to ensure the durability of your assets,
- ability to connect up to 8 Sepam units to one ECI850, ensuring a cost-effective solution,
- IEC 61850 logical nodes and configurable data sets to fit the needs of your Scada system,
- high-performance because the ECI850 is not a generic gateway but a data server dedicated to Sepam,
- up to 6 simultaneous IEC 61850 connections.

With ACE850 communication interface

The Sepam series 40 and Sepam series 80 fitted with the ACE850 communication interface provide a built-in solution for demanding IEC 61850 applications:

- IEC 61850 logical nodes and configurable data sets to fit the needs of your Scada system,
- Peer-to-peer communication capabilities on Sepam series 80 with GOOSE messages to enhance your protection and control system without additional wiring,
- up to 6 simultaneous IEC 61850 connections.

Implementation

The Sepam IEC 61850 solution can be configured in two ways:

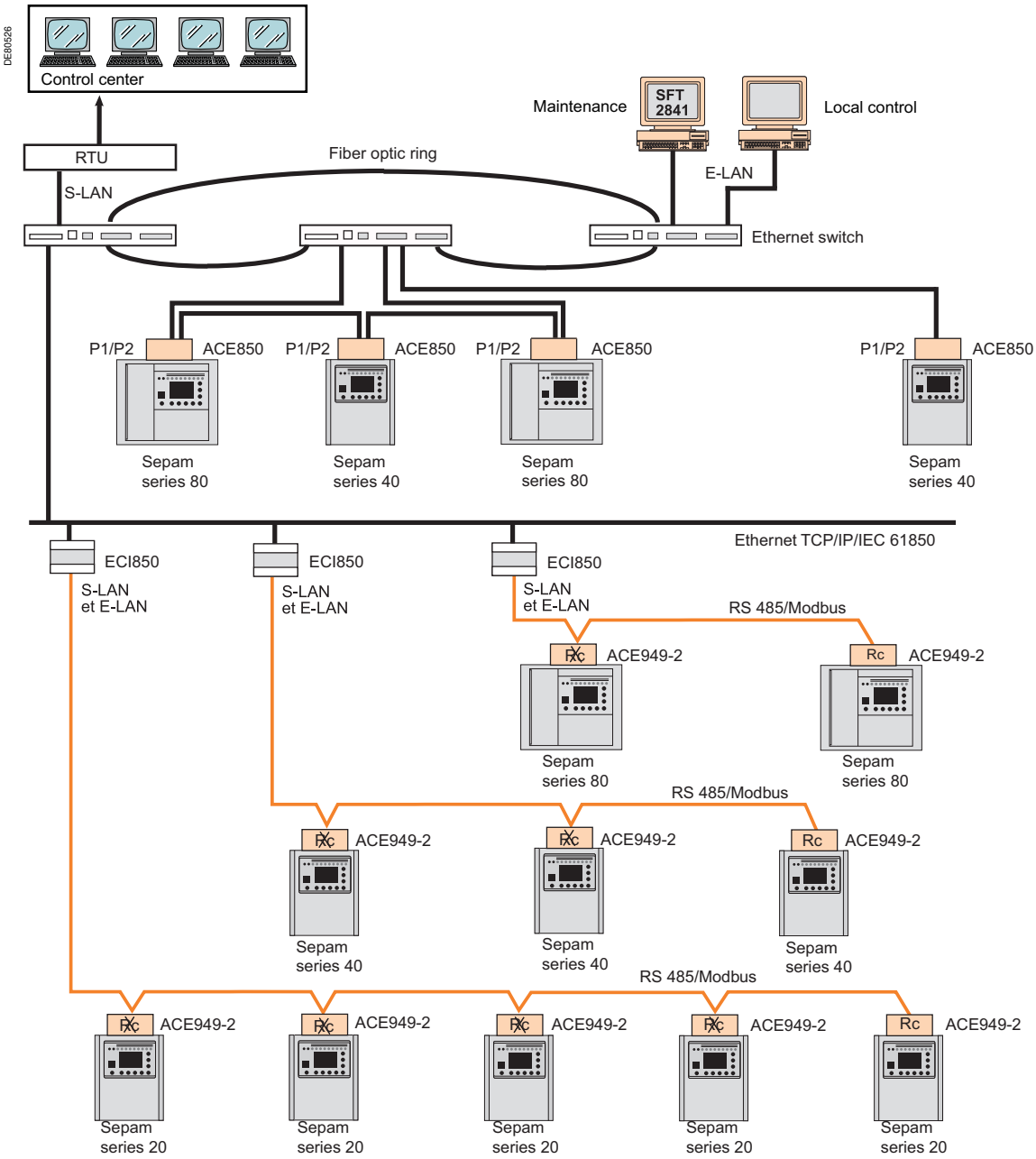
- The SFT2841 setting and operating software ensures straightforward configuration and builds standard IEC 61850 configuration files.
- The SFT850 configuration tools adapt the communication profile of the devices to the precise needs of the system.

The Sepam E-LAN runs in parallel with the IEC 61850 S-LAN, allowing Ethernet connection of the SFT2841 setting and operating software to Sepam without any extra cost.
The Sepam series 40 and Sepam series 80 fitted with the ACE850 communication interface also support the Modbus TCP-IP communication protocol.

Typical architecture

■ The ECI850 Sepam server can be connected to an Ethernet switch using 10/100BASE-T copper wire (radial connection).
■ The Sepam series 40 and Sepam series 80 fitted with the ACE850 communication interface can be connected to an Ethernet switch using:
□ 10/100BASE-T copper wire (radial or ring connection)
□ 100BASE-FX multi-mode fiber optic (radial or ring connection)
In order to optimize system performance, Schneider Electric recommends the following:
■ build a fault-tolerant backbone fiber-optic ring
■ use IEC 61850 compatible managed switches
If Sepam units are connected in a ring configuration, the managed switches must be compatible with RSTP 802.1d 2004 standard.
A global approach for building an Ethernet infrastructure can be found in the "Transparent Factory Network Design and Cabling Guide" edited by Schneider Electric.

IEC 61850 architecture example



Communication implementation steps

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ECI850: IEC 61850 Sepam server.

IEC 61850 communication with the Sepam relays can be implemented using either the ECI850 Sepam server, or the ACE850 communication interface (Sepam series 40 or Sepam series 80 only).
Depending on the communication interface used, the following steps must be performed.

ECI850 Sepam server configuration steps

Configuration of Sepam Modbus interface
Communication between the ECI850 server and the Sepam is based on Modbus. The first step deals with the configuration of the Sepam Modbus interface. It consists of installing the Modbus interface in the equipment, wiring it to the RS 485 network and configuring it, using the SFT2841 software.
Two kinds of communication interface can be used on Sepam:
- ACE949-2 for 2-wire RS 485 network
- ACE959 for 4-wire RS 485 network

Refer to the relevant Sepam user's and operation manual for details.
- Sepam series 20 user's manual, reference PCRED301005EN
- Sepam series 40 user's manual, reference PCRED301006EN
- Sepam series 80 operation manual, reference SEPED303003EN
- Sepam series 80 Modbus manual, reference SEPED303002EN

The physical layer parameters have to be configured, with the authorized values. Remote control must be set in "direct" mode. With Sepam series 80, security features must be disabled.

Parameters	Authorized values
Sepam address	1 to 247
Speed	19200 or 38400 bps
Parity	Even or odd

Configuration of the ECI850 server
The second step deals with the configuration of ECI850 Ethernet and Modbus layers. See page 5.

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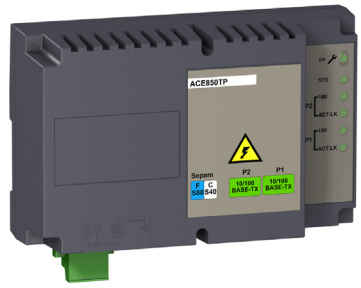

ACE850TP communication interface.

ACE850 communication interface configuration steps

ACE850 communication interface configuration involves configuring the ACE850 Ethernet layer. See page 20.

ECI850 Sepam server/ACE850 communication interface: common configuration steps

These next 2 steps are common to both the ECI850 Sepam server and the ACE850 communication interface.

Configuration of IEC 61850 protocol
The next step deals with the configuration of the IEC 61850 protocol. It generates a CID file which contains the configuration of the communication data for all the Sepam connected to an ECI850 Sepam server or an ACE850 communication interface.
- SFT2841software is used for standard configuration of IEC 61850 (see page 36). All communication data is defined in standard ICD files that are gathered in a CID file depending on the Sepam type.
- SFT850 software is used for advanced configuration of IEC 61850 (see page 43). The configuration can be modified to optimize the exchange between devices:
  - Suppress unused communication data
  - Gather relevant communication data
  - …

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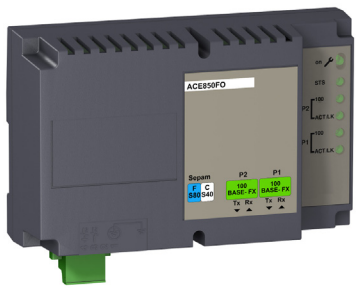

ACE850FO communication interface.

Transfer of the CID file to ECI850 or ACE850
The last step consists of loading the CID file, using the SFT2841 software, into either the ECI850 Sepam server or the ACE850 communication interface.
The ECI850 and the ACE850 first perform a validation of the CID file before using it for configuration. See page 49.

Ethernet setup

Ethernet setup is required to enable access to the ECI850 over a network. If Ethernet setup has already been done at installation time, proceed directly to the section: **Accessing the ECI850 over a network** page 7.

Before configuring the ECI850, obtain a unique static IP address, subnet mask, and default gateway address from the network administrator. Use a web browser or Hyper Terminal to configure the ECI850 with the information obtained from the network administrator, as described in the following sections.

Ethernet setup using Hyper Terminal

1. Connect to ECI850 RS 232 port using the TCSEAK0100 Configuration kit or any null modem cable.
2. Start Hyper Terminal (click **Start** > **Run**, then type `hypertrm`).
3. In the **Name** text box, type a name for the new connection (for example, `ECI config`), then click **OK**.
4. In the **Connect using** drop-down list, select the computer COM port you will be using, then click **OK**.
5. Set the **COM properties** as follows: Bits per second = 19200, Data bits = 8, Parity = None, Stop bits = 1, and Flow control = None. Click **OK**.
6. Start the ECI850 Setup Utility:
   - Cycle power or press the reset button on the ECI850 below the LED power status.
   - While the green Power/Status LED blinks rapidly, press Enter on the computer keyboard to access the setup utility.

Note: *the Power/Status LED stops blinking after 5 seconds.*

7. The following screen should appear:

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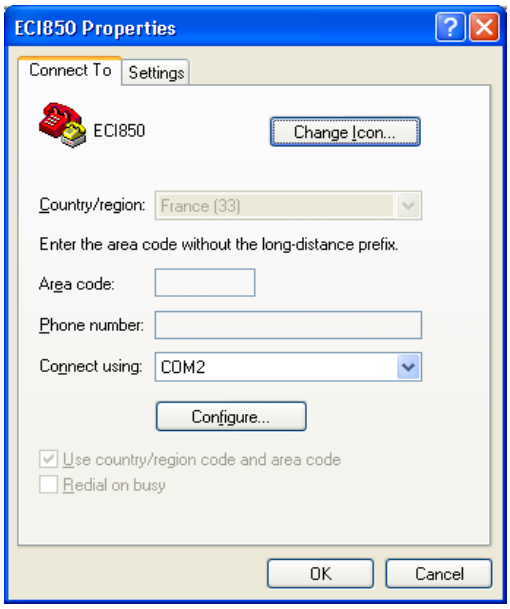
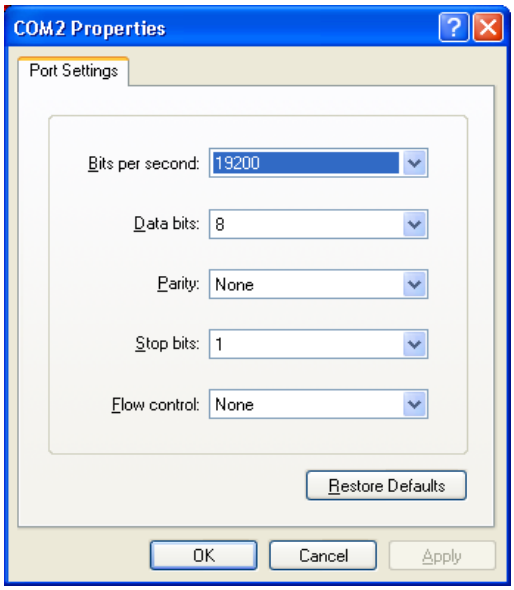


Hyper Terminal: choose connection port.

PE80059



Hyper Terminal: configure serial port.

PE80619

```
**********************************************************************
*                    SETUP UTILITY                                   *
**********************************************************************
**********************************************************************
*  Model Number:      ECI850MG                                       *
*  Firmware Version:  0.02                                           *
*  Serial Number:     33003064                                       *
*  MAC Address:       00:80:67:80:67:E9                              *
*                                                                    *
*  (c) 2007 Schneider Electric. All Rights Reserved.                 *
**********************************************************************

Choose an option:

        1 = Change Language (English)
        2 = Change IP Address (10.195.132.115)
        3 = Change Subnet Mask (255.255.254.0)
        4 = Change Gateway Address (10.195.148.1)
        5 = Change Media Type (10T/100Tx Auto)
        6 = Quit
```

Hyper Terminal: access ECI850 setup utility.

ECI850 setup options

Option	Description	Setting
1	Used to select the language for the current Hyper Terminal session.	English, French, Spanish **Default**: English
2	Used to enter the static IP address of the ECI850.	0.0.0.0 to 255.255.255.255 **Default**: 169.254.0.10
3	Used to enter the subnet mask of the network.	0.0.0.0 to 255.255.255.255 **Default**: 255.255.0.0
4	Used to enter the default gateway (router) IP address used for wide area network (WAN) communications.	0.0.0.0 to 255.255.255.255 **Default**: 0.0.0.0
5	Used to define the physical Ethernet connection.	■ 10T/100Tx Auto ■ 10BaseT-HDo 10BaseT-FD ■ 100BaseTx-HD ■ 100BaseTx-FD **Default**: 10T/100Tx Auto
6	Saves the settings and exits the setup utility.	-

Ethernet setup using a web browser

1. Disconnect your computer from your network.

Note: *after disconnecting from your network, your computer should automatically use the default IP address 169.254.###.### (### = 0 to 255) and the default subnet mask 255.255.0.0. If the IP address is not automatically configured, contact your network administrator to set up a static IP address.*

2. Connect an Ethernet crossover cable (available in the kit TCSEAK0100) from the ECI850 to the computer.
3. Start Internet Explorer (version 6.0 or higher).
4. In the Address text box, type `169.254.0.10`, then press Enter. Type `Administrator` for your Username, type `ECI850` for your Password, then click **OK**. Usernames and Passwords are case sensitive.
5. Set up parameters as described in the ”Ethernet and TCP/IP settings” section on page 8.
6. Reconnect your computer to your network. If you assigned a static IP address to your computer in step 1, you must restore your computer's original settings before reconnecting to your network.

PE80627

ECI850 home page.

Accessing the ECI850 over a network

After setting up the Ethernet parameters, the user can access the ECI850 over an Ethernet LAN using Internet Explorer 6.0 or higher.

Logging into the ECI850

Action	Result
1. Launch Internet Explorer 6.0 or higher.	Opens Internet Explorer.
2. In the Address text box, type the address of your ECI850 (`169.254.0.10` is the default), then press Enter.	Opens the Login dialog box.
3. Type your Username (`Administrator` is the default) and Password (`ECI850` is the default) into the text boxes, then click **OK**.	Enters the Username and Password, then opens the ECI850 home page.
4. Click **Setup** to access the ECI850 setup page, or click **Diagnostics** to access the ECI850 diagnostics page.	Opens the Setup or Diagnostics pages.

Logging Out

We recommend logging out whenever you do not need access to the ECI850. To log out of the ECI850 configuration session, click Log Out to end your session.

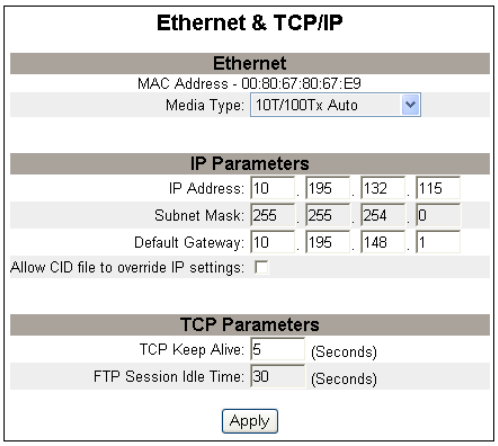
ECI850 user interface overview

The ECI850 ships with several pre-installed web pages used for ECI850 setup, configuration and diagnostics. See Table below for a description of each web page. Access to pages can be restricted (see Web Pages Access).

ECI850 Web Page	Description	See
Setup		
Ethernet & TCP/IP	Configure Ethernet and TCP/IP communication settings.	page 8
Serial Port	Set up or change serial communication parameters.	page 9
IP Filtering	Set up which IP addresses can access the ECI850.	page 10
SNMP Parameters	Enable and configure the Simple Network Management Protocol (SNMP), which allows the ECI850 to identify itself to network devices requesting SNMP data.	page 11
SNTP Parameters	Enable and configure the Simple Network Time Protocol (SNTP), which allows the ECI850 to be time synchronized.	page 12
User Accounts (1)	Create and edit groups and users.	page 9
Web Page Access (1)	Select web page access rights for each user group.	page 10
Diagnostics		
Communication statistics	Displays diagnostic data used to troubleshoot network problems.	page 14
ECI850 Summary	This page contains information about your specific ECI850, including the serial number, manufacturing date and Media Access Control (MAC) address.	page 16
Read Device Registers	Allows ECI850 administrators to read register data from a serial device connected to the ECI850.	page 17

(1) *Accessible by administrators only.*

PE80612


Ethernet & TCP/IP
Ethernet
MAC Address - 00:80:67:80:67:E9
Media Type: 10T/100Tx Auto
IP Parameters
IP Address: 10 . 195 . 132 . 115
Subnet Mask: 255 . 255 . 254 . 0
Default Gateway: 10 . 195 . 148 . 1
Allow CID file to override IP settings:
TCP Parameters
TCP Keep Alive: 5 (Seconds)
FTP Session Idle Time: 30 (Seconds)
Apply

ECI850 Ethernet & TCP/IP page.

Communications setup

Ethernet and TCP/IP settings

Procedure

Action	Result
1. From the Setup page, click **Ethernet & TCP/IP**.	Opens the Ethernet & TCP/IP page.
2. Select your media type. Contact your network administrator if you do not know.	Selects the media type.
3. Enter your IP address, subnet mask, and default gateway address assigned to your ECI850 by your network administrator.	Enters the Ethernet parameters for the ECI850. ***Note:*** *if you enter an IP address that is used by another device, you will be prompted to select a new IP address. See "Duplicate IP address detection" below.*
4. Click **Apply**.	Updates the ECI850 Ethernet and TCP/IP settings.

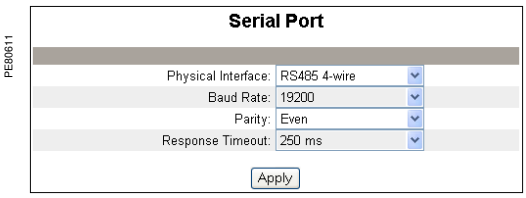
Note: *after making changes to the Ethernet parameters and clicking Apply, the ECI850 will reboot.*

Description of Ethernet and TCP/IP settings

Option	Description	Setting
Media Type	Used to define the physical Ethernet connection or media type.	■ 10T/100Tx Auto ■ 10BaseT-HD ■ 10BaseT-FD ■ 100BaseTX-HD ■ 100BaseTX-FD Default: 10T/100Tx Auto
IP Address	Used to enter the static IP address of the ECI850.	0.0.0.0 to 255.255.255.255 Default: 169.254.0.10
Subnet Mask	Used to enter the Ethernet IP subnet mask address of your network.	0.0.0.0 to 255.255.255.255 Default: 255.255.0.0
Default Gateway	Used to enter the gateway (router) IP address used for wide area network (WAN) communications.	0.0.0.0 to 255.255.255.255 Default: 0.0.0.0
Allow CID file to override IP parameters	Check this box if you want the IP parameters contained in the CID file to replace the above configuration.	Default: not checked
Keepalive	Timeout value used to test for session disconnection.	1 to 60 seconds Default: 30 seconds
FTP session inactivity timeout	Timeout value used to force disconnection of an inactive FTP session	30 to 900 seconds Default: 30 seconds

Duplicate IP address detection

While connected to your network, the ECI850 publishes its IP address. The IP address of the ECI850 must be unique on the network it is connected to. If it is not unique the Power/Status LED repeats a four blink-pause pattern. Assign a new IP address to the ECI850 or to the conflicting device.



ECI850 Serial Port page.

Serial port configuration

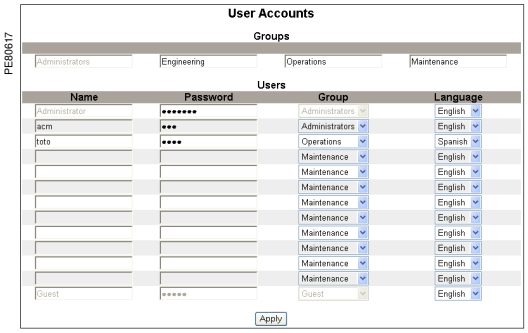
Procedure

Action	Result
1. From the Setup page, click **Serial Port**.	Opens the Serial Port page.
2. Select your physical interface, baud rate, parity, and response timeout (see Table below).	Selects the serial port options.
3. Click **Apply**.	Updates the ECI850 Serial Port settings.

Description of serial port settings

Option	Description	Setting
Physical Interface	Used to select how the ECI850 serial port is physically wired.	RS 485 4-wire, RS 485 2-wire **Default**: RS 485 2-wire
Baud Rate	Used to select the data transmission speed over the serial connection.	19200, 38400 **Default**: 38400
Parity	Used to select which parity bit is used for checking data.	Even, Odd **Default**: Even
Response Timeout	Used to select how long the ECI850 will wait to receive a response from a device. Default value should usually be kept.	0.1 to 2 seconds **Default**: 0.3 second

Note: *the settings defined here must match the settings of the connected Sepam devices.*



ECI850 User Accounts page.

Access control configuration

User accounts

ECI850 users are assigned Usernames and Passwords. Each user belongs to a group, and each group has access rights to the ECI850 web pages assigned by the ECI850 administrator.

Note: *there are two default user accounts: Administrator (password is ECI850) and Guest (password is Guest).*

Procedure

Action	Result
1. From the Setup page, click **User Accounts**.	Opens the User Accounts page.
2. If you want to change a group name, type a new name in one of the **Group** text boxes (the Administrator group name cannot be changed).	Enters a new group name.
3. In the **Users** section, enter a Name (1 to 24 characters) and Password (0 to 12 characters) for a new user. ***Note:*** *Usernames and Passwords are case-sensitive and can contain only alphanumeric characters.*	Enters the name and password for a user.
4. Select a group and the default language for the new user.	Selects the group and language for a user.
5. Repeat steps 3 and 4 for each additional user you want to add.	Continues adding users.
6. Click **Apply**.	Saves all of the user account settings.

ECI850 accounts and passwords description

Account	Default Password
Administrator (default account)	ECI850
Guest (default account)	Guest
User-defined accounts (up to 11 accounts possible)	No default – Password is user-defined

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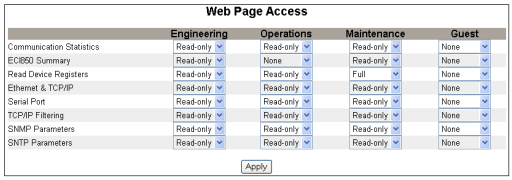


ECI850 Web Page Access page.

Web page access

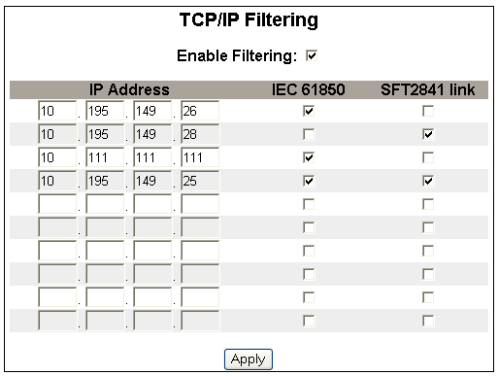
Procedure

Action	Result
1. From the Setup page, click **Web Page Access**.	Opens the Web Page Access page.
2. In the **Communication statistics** row, select the access level (**None**, **Read-only**, or **Full**) that each user group will have for the Ethernet & TCP/IP web page.	See Table below for an explanation of access levels for each group.
3. To allow Guest access to the web page, select **Read-only** under the **Guest** column. if the Guest group is Read-only, other groups can only be set to Read-only or Full.	Allows the default Guest group to access the web page.
4. Repeat steps 2 and 3 for the other rows.	Selects the access level for each web page.
5. Click **Apply**.	Saves the page access settings.

Group access

Group	Access
Administrator	Full access to all web pages. We recommend that you change the default administrator password for system security the first time you log in.
Guest	Read-only access to selected web pages.
Three user-defined groups	Choosing from the following options, the administrator assigns web page access for each group. Access levels are as follows: ■ None: a group has no access to selected web page ■ Read-only: password grants a group read-only access to the selected web page ■ Full: a group has the same access as the Administrator group to the selected web page

PE80613



ECI850 TCP/IP Filtering page.

IP address filtering

This function allows the administrator to specify which IEC 61850 clients and SFT2841 have access to the ECI850 services.

***Note:** if IP addresses filtering is enabled, access is forbidden to any device not in the filtered list.*

Procedure

Action	Result
1. From the Setup page, click **TCP/IP Filtering**.	Opens the **TCP/IP Filtering** page.
2. Check **Enable Filtering**.	Activates filtering.
3. In the **IP address** column, enter the TCP/IP client address	Enters an IP address for a TCP/IP client that will have access to the IEC 61850 server or to the SFT2841 link or both.
4. In the **IEC 61850** and **SFT2841 link** columns, check what applies.	Selects the access level for the corresponding IP address. SFT2841 link, IEC 61850 or both.
5. Repeat steps 3 and 4 to add more IP addresses.	Continues adding IP addresses for filtering.
6. Click **Apply**.	Saves the IP address filtering list.

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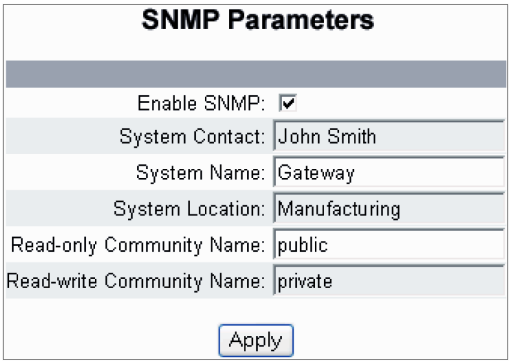


ECI850 SNMP Parameters page.

Configuring additional features

SNMP parameters

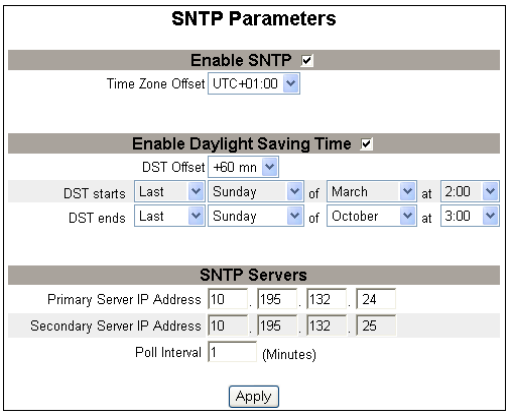
The ECI850 supports SNMP, allowing a network administrator to remotely access it with an SNMP manager and view the networking status and diagnostics in the MIB2 format.

Procedure

Action	Result
1. From the Setup page, click **SNMP Parameters**.	Opens the SNMP Parameters page.
2. Check **ENABLE SNMP** to turn ON the simple network management protocol. ***Note:*** *if you uncheck* ***Enable SNMP*** *and click* ***Apply****, the ECI850 will reboot and SNMP functionality will be turned OFF.*	Activates SNMP.
3. Enter the **system contact**, **system name**, **system location**, **read-only community name**, and the **read-write community name**.	Enters the SNMP system information and community access names.
4. Click **Apply**.	Saves the SNMP settings.

Settings description

Option	Description	Setting
Enable SNMP	Checking the check box enables SNMP and MIB II support	**Default**: not enabled
System Contact	Name of the administrative contact.	String (< 50 characters) **Default**: empty string
System Name	Name given to the ECI850 and Sepam subnet.	String (< 50 characters) **Default**: empty string
System Location	Location of the ECI850.	String (< 50 characters) **Default**: empty string
Read-only Community Name	SNMP community that has read-only access to the MIB. Acts as a password.	String (< 50 characters) **Default**: "public"
Read-write Community Name	SNMP community that has read-write access to the MIB. Acts as a password.	String (< 50 characters) **Default**: "private"


PE80626
SNTP Parameters
Enable SNTP
Time Zone Offset UTC+01:00
Enable Daylight Saving Time
DST Offset +60 mn
DST starts Last Sunday of March at 2:00
DST ends Last Sunday of October at 3:00
SNTP Servers
Primary Server IP Address 10 . 195 . 132 . 24
Secondary Server IP Address 10 . 195 . 132 . 25
Poll Interval 1 (Minutes)
Apply

ECI850 SNTP Parameters page.

SNTP parameters

SNTP is the time synchronization method required by IEC 61850. It is used in mode 3-4 (unicast mode).
The ECI850 supports SNTP to enable synchronization between the ECI850 and Sepam devices.

- If SNTP is not turned ON, time synchronization must be provided to the Sepam devices by other means (ECI850 time is meaningless in that case).
- If SNTP is turned ON, time synchronization must be set up on Sepam, to the communication channel linked to ECI850 (there are 2 communication channels on Sepam series 80).

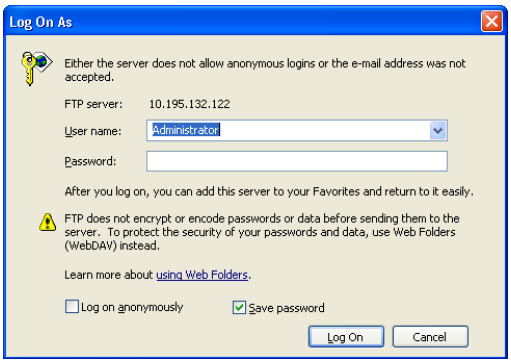
Procedure

Action	Result
1. From the Setup page, click **SNTP Parameters**.	Opens the **SNTP Parameters** page.
2. Check **Enable SNTP** to turn ON the simple network time protocol.	Activates SNTP.
3. Enter the time offset from UTC of your location.	Enters the time zone.
4. Check **Enable DST** to turn ON the Daylight Saving Time (summer Time) feature.	Activates Daylight Saving Time.
5. Enter the time offset for Daylight Saving Time and the start and end time.	Enters DST time offset: start time and end time.
6. Enter the IP address of the primary (or only) SNTP server. If available, enter the IP address of a secondary server to be used if the primary one is not responding.	Enters the address of the SNTP server(s).
7. Enter the poll interval between two requests to the server.	Enters poll interval
8. Click **Apply**.	Saves the SNTP settings.

Setting descriptions

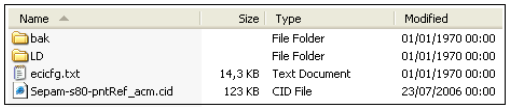
Option	Description	Setting
Enable SNTP	Enables the time and date of the ECI850 to be set by the Simple Network Time Protocol (SNTP) server.	**Default**: not enabled
Time Zone Offset	Determines the difference between local time and Coordinated Universal Time UTC (same as GMT).	UTC-12 to UTC+14 **Default**: UTC
Enable Daylight Saving Time	Enables the use of Daylight Saving Time (Summer time).	**Default**: not enabled
DST offset	Difference between standard time and Daylight Saving Time.	+ 30 or + 60 minutes **Default**: + 60 minutes
DST starts	If enabled, DST starts on the selected date.	**Default**: last sunday of March
DST ends	If enabled, DST ends on the selected date.	**Default**: last sunday of October
Primary Server IP Address	The IP address of the SNTP server the ECI850 contacts to get the time message.	0.0.0.0 to 255.255.255.255 **Default**: 0.0.0.0
Secondary Server IP Address	The IP address of another SNTP server the ECI850 contacts in case the primary server is down.	0.0.0.0 to 255.255.255.255 **Default**: 0.0.0.0
Poll Interval	Controls how often the ECI850 contacts the SNTP server for the correct time.	1 to 300 minutes **Default**: 60 minutes

PE80106


Log On As
Either the server does not allow anonymous logins or the e-mail address was not accepted.
FTP server: 10.195.132.122
User name: Administrator
Password:
After you log on, you can add this server to your Favorites and return to it easily.
FTP does not encrypt or encode passwords or data before sending them to the server. To protect the security of your passwords and data, use Web Folders (WebDAV) instead.
Learn more about using Web Folders.
Log on anonymously
Save password
Log On
Cancel

Logging into the FTP server.

PE80825



ECI850 directories view.

After you set up the Ethernet parameters, you can access the ECI850 FTP server, using Internet Explorer or another FTP client. The following description is made using Internet Explorer 6.

Note: *this server features only a limited implementation of the FTP protocol and is therefore not guaranteed to work with every client.*

Logging into the FTP server

Action	Result
1. Launch Internet Explorer, type `ftp://` and the IP address of the ECI850 in the Address text box (for example, `ftp://10.10.10.10`), then press **Enter**.	Opens the **Log On As** dialog box.
2. Type the Username and the Password in the text boxes, then click **Log On**.	Opens an FTP session with the ECI850 and displays the root directory of the ECI850.

Note: *access to the FTP server is restricted to accounts belonging to the Administrators group.*

ECI850 directories

Root directory

The root directory contains:

- the logical devices directory LD

It is structured as described by the IEC 61850 standard. There is one directory for each Sepam Logical Device. In each of these, a COMTRADE directory contains the disturbance files CFG and DAT These files can only be read. They can also be read using IEC 61850 file transfer.

- the backup directory BAK

It contains the backup IEC 61850 file, if any. This file can only be read. This file is only kept as an archive. It is not used by the ECI850.

- the ECI850 standard configuration file "ecicfg.txt". This file can be read or written. It is checksum protected and must not be modified externally. When written to the ECI850, it updates the device parameters except the Ethernet settings.
- the IEC 61850 configuration file CID (if loaded). This file can be read or written. Its content is protected and can be modified only with the SFT2841 or SFT850 tools.

Transferring files from the ECI850 to the computer

Action	Result
1. Right-click the file you want to download from the ECI850, then click **Copy**.	Copies the selected file.
2. Locate the folder you want to save the copied file, right-click in the folder's window, then click **Paste**.	Pastes the file into the folder.
3. Repeat steps 1 and 2 if you want to copy other files from the ECI850	Continues to copy files from the ECI850.
4. Click the **Close** button on the Internet Explorer window.	Closes Internet Explorer and ends the FTP connection to the ECI850.

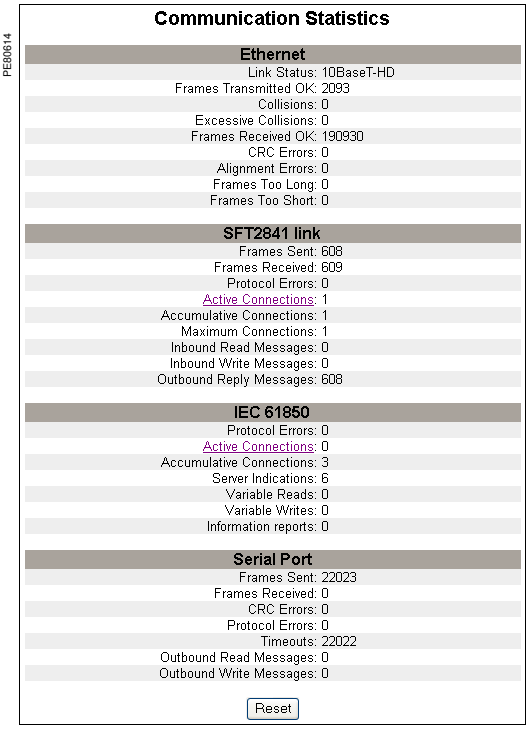
Transferring files from the computer to the ECI850

Write-able files are transferred to the ECI850 as described above, inverting source and destination folders.
IEC 61850 configuration files can also be transferred with the SFT2841 software (see page 40).

Introduction

Diagnostics pages provide useful information for network monitoring, tuning, and troubleshooting.
There are 3 diagnostics pages:

- Communication statistics page to troubleshoot Ethernet TCP/IP communication
- ECI850 summary page to display information about the ECI850 Sepam server
- Read device registers page to troubleshoot Modbus communication



ECI850 Communication Statistics page.

Communication statistics

Procedure

Action	Result
1. From the **Diagnostics** page, click **Communication Statistics**.	Opens the **Communication Statistics** page.
2. View the data	See “Interpreting Statistics” below.
3. Click **Reset**.	Resets the ECI850 cumulative diagnostic data to 0.

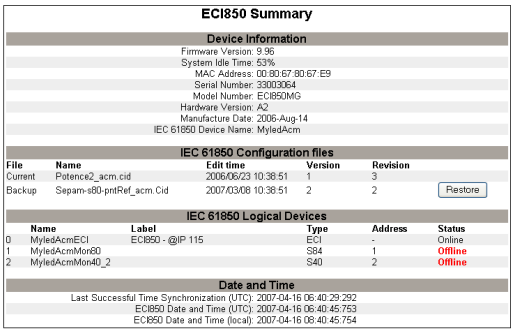
Interpreting statistics

Statistic	Description
Ethernet	
Link Status	A status string that represents the speed and duplex setting being used to communicate with the linking partner.
Frames Transmitted OK	A counter that increments each time a frame is successfully transmitted.
Collisions	A counter that increments each time a frame is retransmitted due to collision detection.
Excessive Collisions	A counter that increments each time a frame is not able to be sent due to reaching the maximum collision status based on the Truncated Binary Exponential Backoff algorithm.
Frames Received OK	A counter that increments each time a frame is successfully received.
CRC Errors	A counter that increments each time a frame is received that has a checksum/CRC that does not match what is calculated.
Alignment Errors	A counter that increments each time a frame is received that has a checksum/CRC error and does not end on an 8-bit frame boundary.
Frames Too Long	A counter that increments each time a frame is received that is larger than the allowed maximum size defined in the standards (frames larger than 1518 bytes).
Frames Too Short	A counter that increments each time a frame is received that is smaller than the allowed minimum size defined in the standards (frames smaller than 64 bytes).
SFT2841 link	
Frames Sent	A counter that increments each time a frame is sent.
Frames Received	A counter that increments each time a frame is received.
Protocol Errors	A counter that increments each time an ill-formed message is received.
Active Connections	A status value that represents the number of connections that are active at the moment the diagnostics page is refreshed. A maximum of 4 connections are supported. Clicking Active Connections opens a new window with a list of all of the active client connections.
Accumulative Connections	A counter that increments each time a connection is made to the ECI850.
Maximum Connections	A status value that represents the maximum number of connections that were active at any given moment.
Inbound Read Messages	A counter that increments each time a read request message is received.
Inbound Write Messages	A counter that increments each time a write request message is received.
Outbound Reply Messages	A counter that increments each time a reply message is sent.

Interpreting statistics (cont.)

Statistic	Description
IEC 61850	
Protocol Errors	A counter that increments each time a received request is incorrect or cannot be satisfied.
Active Connections	A status value that represents the number of connections that are active at the moment the diagnostics page is refreshed. A maximum of 6 connections are supported. Clicking Active Connections opens a new window with a list of all of the active client connections.
Accumulative Connections	A counter that increments each time a connection is made to the ECI850.
Server indications	A counter that increments each time the server receives a protocol indication.
Variable Reads	A counter that increments each time the server receives a read variable request.
Variable Writes	A counter that increments each time the server receives a write variable request.
Information reports	A counter that increments each time the server sends an information report message.
Serial port	
Frames Sent	A counter that increments each time a frame is sent.
Frames Received	A counter that increments each time a frame is received.
CRC Errors	A counter that increments each time a message is received that has a CRC that does not match what is calculated. Typically the result of wiring issues.
Protocol Errors	A counter that increments each time an ill-formed message is received.
Timeouts	A counter that increments each time a request message is sent without receiving a corresponding response message within the allowed time. Timeouts are typically the result of configuration errors or a non-responsive device.
Outbound Read Messages	A counter that increments each time a read request message is sent.
Outbound Write Messages	A counter that increments each time a write request message is sent.

PE80620


ECI850 Summary
Device Information
Firmware Version: 9.96
System Idle Time: 53%
MAC Address: 00:80:67:80:67:E9
Serial Number: 33003064
Model Number: ECI850MG
Hardware Version: A2
Manufacture Date: 2006-Aug-14
IEC 61850 Device Name: MyledAcm
IEC 61850 Configuration files
File Name Edit time Version Revision
Current Potence2_acm.cid 2006/06/23 10:38:51 1 3
Backup Sepam-s80-pntRef_acm.Cid 2007/03/08 10:38:51 2 2
Restore
IEC 61850 Logical Devices
Name Label Type Address Status
0 MyledAcmECI ECI850 - @IP 115 ECI - Online
1 MyledAcmMon80 S84 1 Offline
2 MyledAcmMon40_2 S40 2 Offline
Date and Time
Last Successful Time Synchronization (UTC): 2007-04-16 06:40:29:292
ECI850 Date and Time (UTC): 2007-04-16 06:40:45:753
ECI850 Date and Time (local): 2007-04-16 08:40:45:754

ECI850 Summary page.

ECI850 Summary

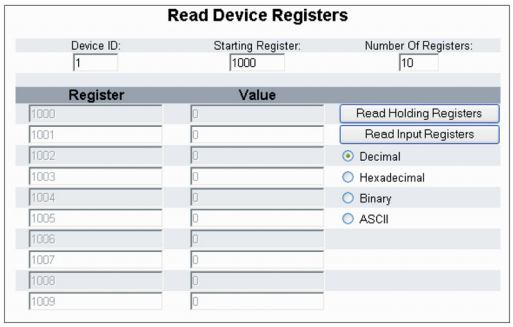
Procedure

Action	Result
1. From the **Diagnostics** page, click **ECI850 Summary**.	Opens the **ECI850 Summary** page.
2. View the data	See “Interpreting information” below.

Interpreting information

Information	Description
Device Information	
Firmware Version	The firmware version that is installed on the ECI850
System Idle Time	A percentage from 0% to 100% indicating the average processor time that is not being used
MAC Address	The unique Ethernet hardware address of the ECI850
Serial Number	The serial number of the ECI850
Model Number	The ECI850 model number
Hardware Version	The ECI850 hardware version
Manufacture Date	The date the ECI850 was manufactured
IEC 61850 Device Name	The name given to the ECI850 device in the IEC 61850 configuration file
IEC 61850 Configuration files	
File	"*Current*" is the last loaded CID file "*Backup*" is the archived CID file
Name	Name of the file as defined at loading
Edit time	Time at which the configuration file has been created
Version	Version of the file as defined in the file header
Revision	Revision of the file as defined in the file header
Restore	This button overwrites the content of the current file with the content of the backup file.
IEC 61850 Logical devices	
Name	Name of the logical device built from the configuration file
Label	Label of the device (Sepam label or ECI850 system name)
Type	Type of the device as declared in the configuration file
Address	Modbus address of the device as declared in the configuration file
Status	■ Offline: the declared device does not respond to ECI850 requests ■ Wrong type: the device at this address is not of the expected type ■ Init: the device database is being initialized ■ Online: the device is operational ■ Bad Conf.: there is an error in the configuration file, the device is ignored
Date and time	
Last Successful Time Synchronization (UTC)	Displays the last time the ECI850 successfully contacted the SNTP server (UTC time).
ECI850 Date and Time (UTC)	Current time and date of the ECI850 (UTC time).
ECI850 Date and Time (local)	Current time and date of the ECI850 (local time).

PE80615



ECI850 Read Device Registers page.

Read Device Registers

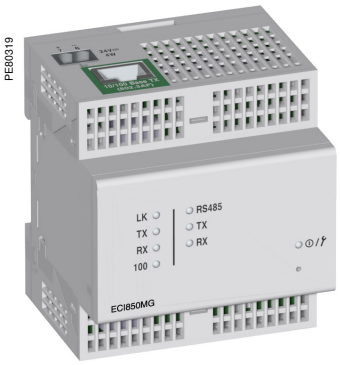
Read Device Registers page can be used to check Modbus communication between the ECI850 and Sepam devices.

Procedure

Action	Result
1. From the Diagnostics page, click **Read Device Registers**.	Opens the Read Device Registers page.
2. Enter the **Device ID**, **Starting Register** number, and the **Number of Registers** to read.	Enters the values to begin reading registers for the specified device.
3. Click **Read Holding Registers** or **Read Input Registers**.	Displays the values for the listed registers.
4. To change how the data is displayed in the **Value** column, select **Decimal**, **Hexadecimal**, **Binary**, or **ASCII**.	Selects how the data values are displayed.

ECI850 Read Device Register Settings

Option	Description	Default
Device ID	The address of the device that registers are read.	1
Starting Register	The first register to read.	1000
Number of Registers	The number of registers to read (1 to 10).	10
Register column	Lists the register numbers.	-
Value column	Lists the data stored in a register.	-
Decimal, Hexadecimal, Binary, or ASCII options	Select an option to specify how the Value column data is displayed.	Decimal



ECI850: IEC 61850 Sepam server.

Installation and operating instructions

The ECI850 Sepam server must be installed and connected in accordance with the instructions in the following documents:

- ECI850 installation guide (delivered with each ECI850), reference 63230-216-314,
- Sepam series 20 user's manual, reference PCRED301005EN,
- Sepam series 40 user's manual, reference PCRED301006EN,
- Sepam series 80 operation manual, reference SEPED303003EN.

To download these documents, follow the procedure below:

1. Go to www.schneider-electric.com.
2. Type Sepam in the Search field.
3. Click Sepam series xx.
4. Click Download.
5. Click Technical Publications.
6. Click the manual you want to download.

Troubleshooting

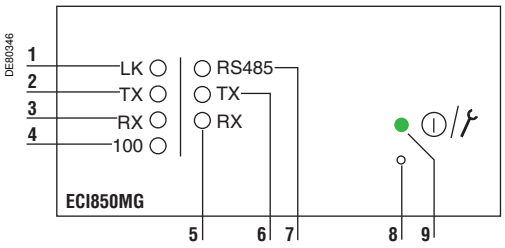
Troubleshooting makes use of:

- ECI850 front panel LED indicators
- ECI850 web diagnostics pages

It should be done in the following order:

1. Check the ECI850 connection to Ethernet.
2. Check the Modbus subnetwork.
3. Check the IEC 61850 configuration.

ECI850 front panel LED indicators



Ethernet status LEDs (green):

1 LK LED on: Ethernet link active
2 TX LED flashing: transmitting data
3 RX LED flashing: receiving data
4 100 LED
- On: 100 Mb link speed
- Off: 10 Mb link speed

Serial status LEDs (yellow):

5 RX LED flashing: receiving data
6 TX LED flashing: transmitting data
7 RS 485 link mode:
- On: RS 485 mode
- Off: RS 232 mode

8 Reset button
9 Power/status LED

ECI850 and Ethernet troubleshooting

Symptoms	Possible cause	Action/Remedy
Power/Status LED off	Source power is not applied or is not stable.	Apply power or check source.
	LED is burned out.	Check to see if other LEDs operate properly.
Ethernet LK LED off	Proper link is not established.	1. Make sure the proper cable is used and connected. 2. Make sure the proper media type is selected in the ECI850. 3. Check the communications setup configuration.
Power/Status LED repeats a four blink-pause pattern.	The IP address that the ECI850 was assigned is being used by another network device.	Assign a new IP address to the ECI850 or to the conflicting device. ***Note:*** *when a duplicate IP address is detected, the ECI850 resets its specified IP address to the default IP address. When the ECI850 detects the conflict no longer exists, it will use the specified IP address.*
Cannot browse the ECI850.	Incorrect network configuration.	1. Verify all IP parameters are correct. 2. Verify ECI850 receives requests: ping ECI850 by: ■ going to DOS prompt ■ typing `ping` and the ECI850 IP address, e.g.: `ping 169.254.0.10`. 3. Verify that all browser internet connections settings are correct.

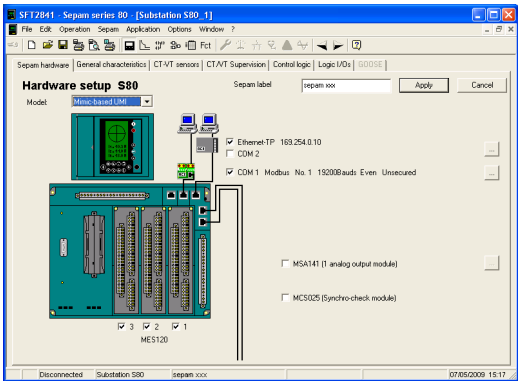
Modbus subnetwork troubleshooting

Symptoms	Possible cause	Action/Remedy
RS 485 LED off	ECI850 has not started correctly.	Check to see if there is an Ethernet connection problem.
Serial TX not flashing	The IEC 61850 server is not configured and there is no SFT2841 remote connection active.	This is a normal situation.
	The IEC 61850 server is not configured and there a SFT2841 remote connection active.	The SFT connection can be active on another ECI850. Check IP addresses.
	The IEC 61850 server is configured and there is no SFT2841 remote connection active.	Check the IEC 61850 configuration file.
Serial TX flashing Serial RX not flashing	Setting of ECI850 serial port does not match setting of Sepam devices.	Check and correct settings.
	Modbus addresses configured in the IEC 61850 file or in the SFT2841 do no match Sepam addresses.	Check and correct addresses.
	The RS 485 network is not wired properly.	Check and correct wiring.

IEC 61850 configuration troubleshooting

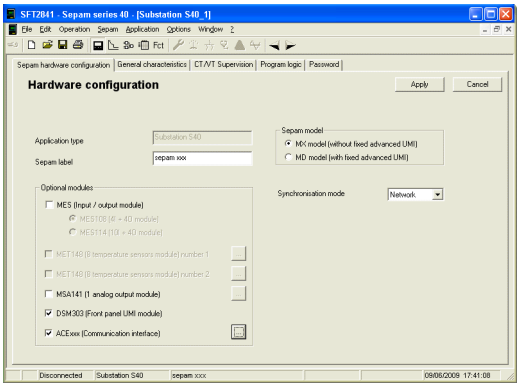
Symptoms	Possible cause	Action/Remedy
IEC 61850 clients can not connect to the ECI850	Ethernet setup is not correct.	See above.
	The maximum number of active connections is reached.	Check the active clients.
IEC 61850 clients connect to the ECI850, but no data is available	The IEC 61850 server is not configured or the configuration file is not valid.	Download a valid configuration file.
The IEC 61850 server is working, but some logical devices do not report data.	The actual Sepam type at a given address is not the type expected in the configuration file.	Check device address, correct the configuration file or replace device.
	The device is not communicating.	Check device, check its communication parameters, check wiring.

PE80394



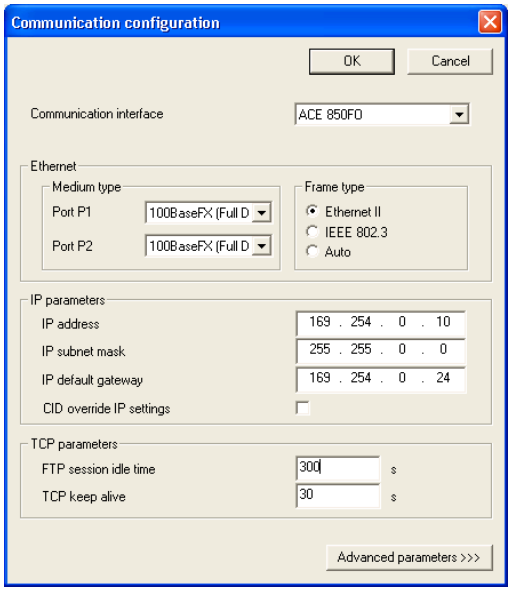
SFT2841: Sepam series 80 configuration screen.

PE80469



SFT2841: Sepam series 40 configuration screen.

PE80395



SFT2841: Ethernet configuration.

Access to configuration parameters

Configuring an ACE850 involves:
- configuring the standard Ethernet parameters (mandatory)
- configuring one or more of the following sets of advanced optional parameters:
  - SNMP: Ethernet network management
  - SNTP: time synchronization
  - IP filtering: access control
  - RSTP: Ethernet ring management
  - User accounts: access control.

The configuration parameters can be accessed from the Communication configuration window in the SFT2841 software.
To access this window:
- For Sepam series 80:
  - open the **Sepam configuration** window in SFT2841
  - select the Ethernet communication port
  - click on the relevant button ... : the **Communication configuration** window appears
  - select the type of interface used: ACE850TP or ACE850FO.

- For Sepam series 40:
  - open the **Sepam hardware configuration** window in SFT2841
  - check the "ACExxx Communication interface" box
  - click on the relevant button ... : the **Communication configuration** window appears
  - select the type of interface used: ACE850TP or ACE850FO.

Ethernet and TCP/IP configuration

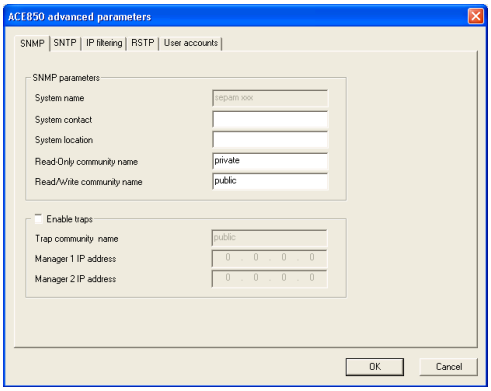
Before configuring the ACE850, obtain a unique static IP address, subnet mask, and default gateway address from the network administrator. See page 23.

Parameters	Description	Authorized values
Frame format	Used to select the format for data sent over an Ethernet connection.	Ethernet II, 802.3, Auto **Default**: Ethernet II
Media type	Used to define the physical Ethernet connection.	ACE850TP ■ 10T/100Tx Auto ■ 10BaseT-HD ■ 10BaseT-FD ■ 100BaseTX-HD ■ 100BaseTX-FD **Default**: 10T/100Tx Auto
		ACE850FO ■ 100BaseFX-HD ■ 100BaseFX-FD **Default**: 100BaseFX-FD
IP address	Used to enter the static IP address of the ACE850.	0.0.0.0 to 255.255.255.255 **Default**: 169.254.0.10
Subnet mask	Used to enter the subnet mask of your network.	0.0.0.0 to 255.255.255.255 **Default**: 255.255.0.0
Default gateway	Used to enter the default gateway (router) IP address used for wide area network (WAN) communications.	0.0.0.0 to 255.255.255.255 **Default**: 0.0.0.0
Allow CID file to override IP parameters	This parameter is not used for Modbus only communication.	**Default**: not checked
Keep alive	Timeout value used to test for session disconnection.	1 to 60 seconds **Default**: 30 seconds
FTP session inactivity timeout	Timeout value used to force disconnection of an inactive FTP session	30 to 900 seconds **Default**: 30 seconds

Duplicate IP address detection

The ACE850 IP address must be unique in the network. If it is not unique, the Status LED repeats a four blink-pause pattern and a new IP address must be assigned to the ACE850 or to the conflicting device.

PE80396



SFT2841: SNMP configuration.

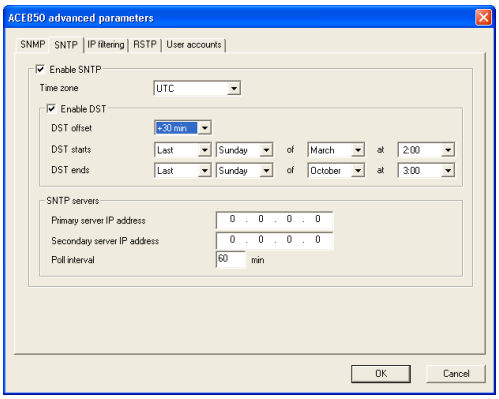
SNMP configuration

The ACE850 supports SNMP V1, allowing a network administrator to remotely access it with an SNMP manager and view the network status and diagnostics in the MIB2 format (only a subset of MIB2 is implemented).
Additionally, the ACE850 may be configured to send SNMP traps in the following cases:

- ACE850 start/restart
- Link up
- Link down
- Authentication failure.

Parameters	Description	Authorized values
System Name	This parameter is the same as the Sepam label.	Not modifiable from this screen.
System Contact	Name of the administrative contact	String (< 16 characters) **Default**: empty string
System Location	Location of the Sepam/ACE850	String (< 16 characters) **Default**: empty string
Read-only Community Name	SNMP community that has read-only access to the MIB. Acts as a password	String (< 16 characters) **Default**: "public"
Read-write Community Name	SNMP community that has read-write access to the MIB. Acts as a password	String (< 16 characters) **Default**: "private"
Enable traps	Checking this check box enables SNMP to send traps.	**Default**: "not checked"
Traps Community Name	SNMP community that is used with traps	String (< 16 characters) **Default**: "public"
Manager 1 IP address	IP address of the SNMP manager to which traps are sent	0.0.0.0 to 255.255.255.255 **Default**: 0.0.0.0
Manager 2 IP address	IP address of a second SNMP manager to which traps are sent	0.0.0.0 to 255.255.255.255 **Default**: 0.0.0.0

PE80397



SFT2841: SNTP configuration.

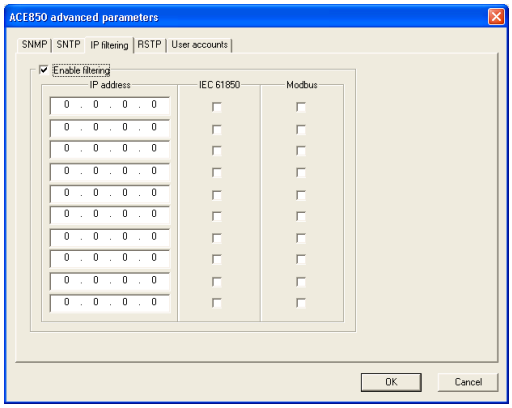
SNTP configuration

SNTP is a time synchronization protocol that can be used to synchronize the Sepam. SNTP is used in mode 3-4 (unicast mode).

- If SNTP is used, the synchronization source for Sepam must be defined as Ethernet.
- If SNTP is not used, the Sepam synchronization must be ensured by other means (Modbus frames, synchronization tops).

Parameters	Description	Authorized values
Enable SNTP	Enables the time and date of the Sepam to be set by the Simple Network Time Protocol (SNTP) server.	**Default**: not enabled
Time Zone Offset	Determines the difference between local time and Coordinated Universal Time (UTC) (same as GMT).	UTC-12 to UTC+14 **Default**: UTC
Enable Daylight Saving Time	Enables the use of Daylight Saving Time (Summer time).	**Default**: not enabled
DST offset	Difference between standard time and Daylight Saving Time.	+ 30 or + 60 minutes **Default**: + 60 minutes
DST starts	If enabled, DST starts on the selected date.	**Default**: last Sunday of March
DST ends	If enabled, DST ends on the selected date.	**Default**: last Sunday of October
Primary Server IP Address	The IP address of the SNTP server the ACE850 contacts to get the time message.	0.0.0.0 to 255.255.255.255 **Default**: 0.0.0.0
Secondary Server IP Address	The IP address of another SNTP server the ACE850 contacts in case the primary server is down.	0.0.0.0 to 255.255.255.255 **Default**: 0.0.0.0
Poll Interval	Controls how often the ACE850 contacts the SNTP server for the correct time.	1 to 300 minutes **Default**: 60 minutes

PE80398



SFT2841: IP filtering configuration.

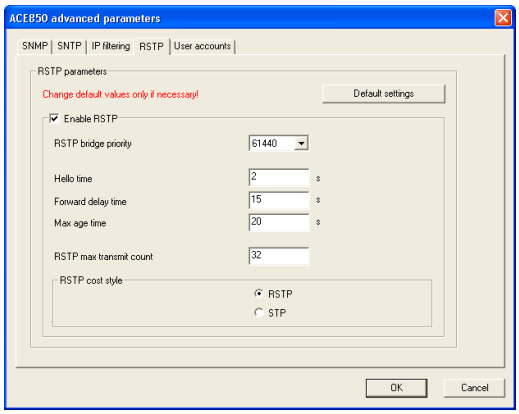
IP filtering configuration

The IP filtering function allows the administrator to specify which Modbus/TCP clients and which IEC 61850 clients have access to the ACE850 services.

Note: *if IP filtering is enabled, access is forbidden to any client not in the filtered list.*

Parameters	Description	Authorized values
Enable filtering	Check this box to activate filtering based on IP addresses.	**Default**: not enabled
IP address	The IP address of a client for which filtering options are defined.	0.0.0.0 to 255.255.255.255 **Default**: 0.0.0.0
IEC 61850	Check this box to grant IEC 61850 access to the given IP address.	**Default**: not checked
Modbus	Check this box to grant Modbus/TCP access to the given IP address.	**Default**: not checked

PE80399



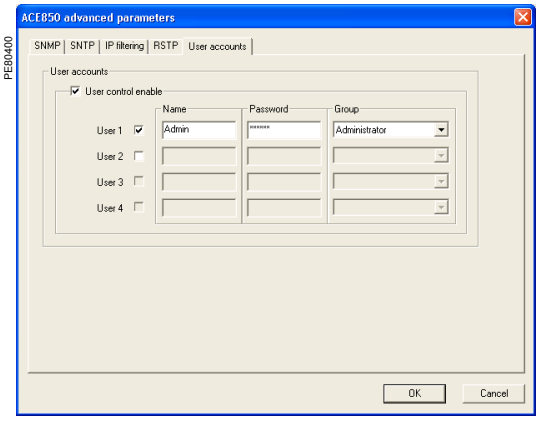
SFT2841: RSTP configuration.

RSTP configuration

The RSTP protocol enables the use of redundant Ethernet architectures such as rings.
It must be enabled each time the ACE850 is included in a loop. It may be disabled in other cases.
Changing the default settings is normally not required and should be performed with extreme care as it could jeopardize the stability of the Ethernet network.
If in doubt, it is always possible to revert to the default values using the "default settings" button.

Parameters	Description	Authorized values
Enable RSTP	Check this box to activate the use of the RSTP protocol.	**Default**: enabled
Bridge priority	Priority of the bridge. The bridge with the lowest priority becomes root.	0 - 61440, by steps of 4096 **Default**: 61440
Hello time	Amount of time between the transmission of configuration messages	1 to 10 seconds **Default**: 2 seconds
Forward delay time	Time value to control how fast a port changes its spanning state when moving towards the forwarding state	4 to 30 seconds **Default**: 21 seconds
Max age time	Valid duration of configuration message once sent by the root bridge	6 to 40 seconds **Default**: 40 seconds
Max transmit count	Maximum BPDUs that can be transmitted by the Port Transmit state machine in any Hello time. This value limits the maximum transmission rate.	3 to 100 **Default**: 32
Cost style	RSTP (32 bits) or STP (16 bits) cost style selection	**Default**: RSTP

Note: *RSTP parameters must verify the following relationships:*
- *2 x (Forward_delay_time - 1 second) ⩾ Max_age_time*
- *Max_age_time ⩾ 2 x (Hello_time + 1 second).*



SFT2841: User accounts configuration.

User accounts configuration

ACE850 users are assigned usernames and passwords used to gain access to the FTP or web servers. Each user belongs to a group which determines the user's access rights:

- Administrator: read-write access to the FTP server, access to the web server
- Operator: read-only access to the FTP server, access to the web server
- Guest: no access to the FTP server, access to the web server

Up to 4 user accounts can be defined.

Parameters	Description	Authorized values
User control enable	Check this box to enable the configuration of users account. Currently, the ACE850 will not operate if this box is not checked. Ensure that this box is always checked.	**Default**: enabled
User n	Check this box to create this user account. Uncheck it to delete the account (only the last account in the list can be deleted).	**Default**: user 1 enabled Users 2 to 4 disabled
Name	User name	String (1 to 8 characters)
Password	User password	String (4 to 8 characters)
Group	Group to which the user belongs	Administrator, Operator, Guest

The following account is always created by default as user 1:

- Name: Admin
- Password: ACE850
- Group: Administrator

IP address and parameter guidelines

IP addresses

Several configuration parameters are IP addresses. These addresses must follow precise rules which are enforced by SFT2841 and ACE850. These rules are:

- Every IP address is made of 4 fields separated by dots: x . y . z . t
- Each field is a decimal value coded on 8 bits (range [0..255]).
- The first field (x) must be in the range [1..224] but must not be 127.
- Intermediate fields can cover the full range [0..255].
- The last field must not be 0 (range [1..255]).

IP subnet mask

The IP subnet mask is also made of 4 dot separated fields:

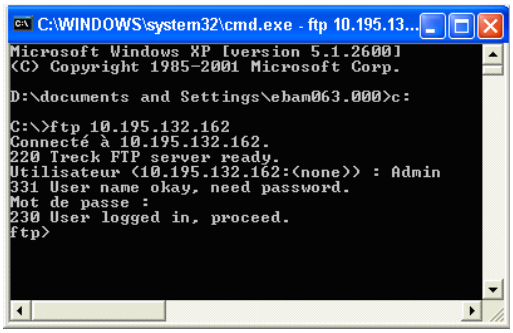
- The binary representation of the subnet mask is made of a set of 8 to 30 contiguous ones in the most significant part, followed by a set of contiguous zeroes (255.0.0.0 to 255.255.255.252).
- For a class A IP address ($x \leqslant 126$), the number of ones in the subnet mask must be at least 8 (255.y.z.t).
- For a class B IP address ($128 \leqslant x \leqslant 191$), the number of ones in the subnet mask must be at least 16 (255.255.z.t).
- For a class C IP address ($192 \leqslant x \leqslant 223$), the number of ones in the subnet mask must be at least 24 (255.255.255.t).
- The subnet part of the device IP address, obtained when applying the subnet mask, must not be 0.

IP default gateway

- An IP address of 0.0.0.0 means no gateway.
- If a gateway is defined, it must belong to the same subnet as the device.

After you set up the Ethernet parameters, you can access the ACE850 FTP server. It features a limited implementation of the FTP protocol and is therefore compatible only with command-line mode FTP clients. The following description is made using the Windows client.

Note: *Access to the FTP server is restricted to authorized user accounts.*



Using the FTP server

Connecting to the FTP server

- Start the command line interface (start menu, then execute "cmd")
- If required, change to your working directory
- Run ftp on the desired IP address
- Give user name and password when prompted

FTP commands

The main FTP client commands that can be used are:

- cd: to change the current target directory
- put: to load a file into the ACE850
- get: to get a file from the ACE850
- dir: to list the files of the target directory
- bye: to disconnect from the ACE850
- help: to get help on using the ftp client

ACE850 file system structure

The ACE850 file system comprises two volumes named "`flash0:`" and "`ram0:`". The ftp server always starts on the flash0 volume. To switch from one volume to the other, use the following commands:

```
cd ram0:\
cd flash0:\
```

Flash0 volume content

This volume contains:

- the IEC 61850 configuration file "CID" (if loaded). This file can be read or written. Its content is protected and can be modified only with the SFT2841 or SFT850 tools.
- the backup directory "bak". It contains the backup IEC 61850 file, if any. This file can only be read. This file is only kept as an archive. It is not used by the ACE850.
- the system directories "fw" and "wwwroot". These directories contain firmware and system files and they should never be modified unless instructed to do so.

Ram0 volume content

This volume contains:

- the logical devices directory LD

As described by the IEC 61850 standard, it contains a directory bearing the same name as the Sepam Logical Device, in which a COMTRADE directory gathers the disturbance files CFG and DAT. These files can only be read. They can also be read using IEC 61850 file transfer.

- a system directory "fw" that should never be modified.

The ACE850 features an embedded web server that enables network and device monitoring, tuning, and troubleshooting.

Accessing the ACE850 over the network

After you have set up the Ethernet parameters, you can access the ACE850 over an Ethernet LAN using a web browser (Internet explorer 6.0 or higher, Mozilla Firefox …).

Accessing the ACE850 Web server

1. Start your web browser.
2. In the address text box, type the address of the ACE850 (`169.254.0.10` is the default), then press Enter.
3. Type your username and password in the login window (default is `Admin`, `ACE850`).
4. Choose the language for the current session, using the Home menu (left side).

PE80830

ACE850 home page.

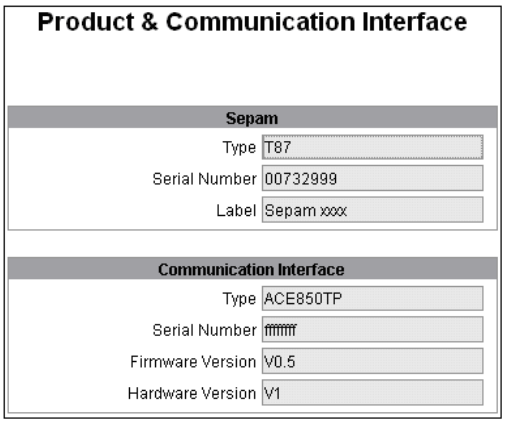
Logging Out

We recommend logging out whenever you do not need access to the ACE850.
To log out of the ACE850 configuration session, click Log Out to end your session.
This feature is only available with Internet Explorer. With other web browsers, the browser's window must be closed.

Home menu

Click Home, to access the Home menu. With this menu, you can:
- Change the language for the current session
- Display the About page that provides information about Sepam and ACE850

PE80640



ACE850 About page.

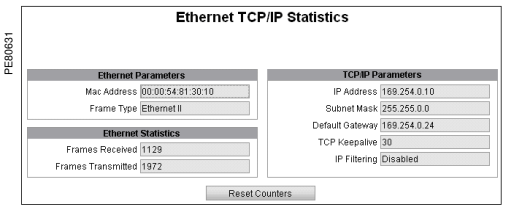
Diagnostics Web pages

Click Diagnostics to access the diagostics menu.
There are 2 general diagnostics pages dealing with Ethernet operation:
- Ethernet global statistics
- Ethernet port statistics

There is also a set of protocol dedicated diagnostics pages:
- Modbus statistics
- IEC 61850 statistics
- SNMP statistics
- SNTP statistics
- RSTP statistics

Diagnostics pages are automatically refreshed every 5 seconds (approximately).

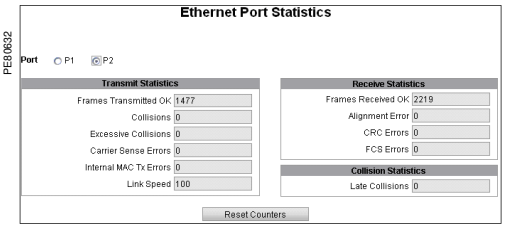
Ethernet statistics



ACE850 Ethernet TCP/IP statistics.

Ethernet and TCP/IP statistics

Item	Description
Mac address	Unique Ethernet hardware address of the ACE850
Frame type	Value of the frame type configured with SFT2841
TCP/IP parameters	Parameter values configured with SFT2841
Frames received	Total number of received Ethernet frames, regardless of port or protocol
Frames transmitted	Total number of transmitted Ethernet frames, regardless of port or protocol
Reset Counters button	Button to reset the Ethernet counters

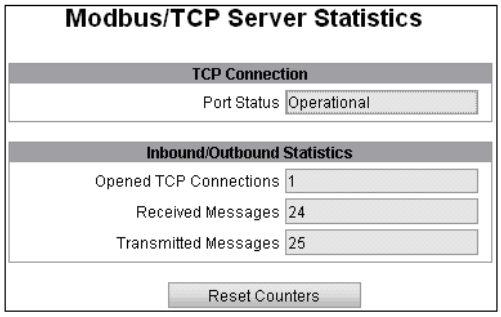


ACE850 Ethernet port statistics.

Ethernet port statistics

Item	Description
Port P1/P2 buttons	Selection of the port of which statistics are displayed
Frames transmitted OK	A counter that increments each time a frame is successfully transmitted.
Collisions	A counter that increments each time a frame is retransmitted due to collision detection.
Excessive collisions	A counter that increments each time a frame cannot be sent because it has reached the maximum collision status based on the Truncated Binary Exponential Backoff algorithm.
Carrier sense errors	A counter that increments each time there is a collision because carrier sense is disabled.
Internal MAC Tx errors	A counter that increments for every transmission error that is not caused by late, excessive, or carrier sense collisions.
Link speed	Actual link speed
Frames received OK	A counter that increments each time a frame is successfully received.
Alignment errors	A counter that increments each time a received frame has an FCS error and does not end on an 8-bit frame boundary.
CRC errors	A counter that increments each time a received frame has a CRC or an alignment error.
FCS errors	A counter that increments each time a received frame has a FCS or an alignment error.
Late collisions	A counter that increments each time a collision occurs after the slot time (512 bits starting at the preamble).
Reset counters button	Button to reset the port counters

Modbus statistics

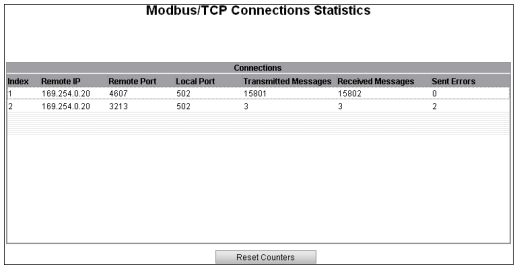


ACE850 Modbus/TCP server statistics.

Modbus/TCP server statistics

Item	Description
Port status	Modbus port status
Opened TCP connections	Number of Modbus clients currently connected
Received messages	Total number of Modbus requests
Transmitted messages	Total number of Modbus responses
Reset counters button	Button to reset the Modbus counters

Note: *the web interface uses one Modbus connection to operate.*

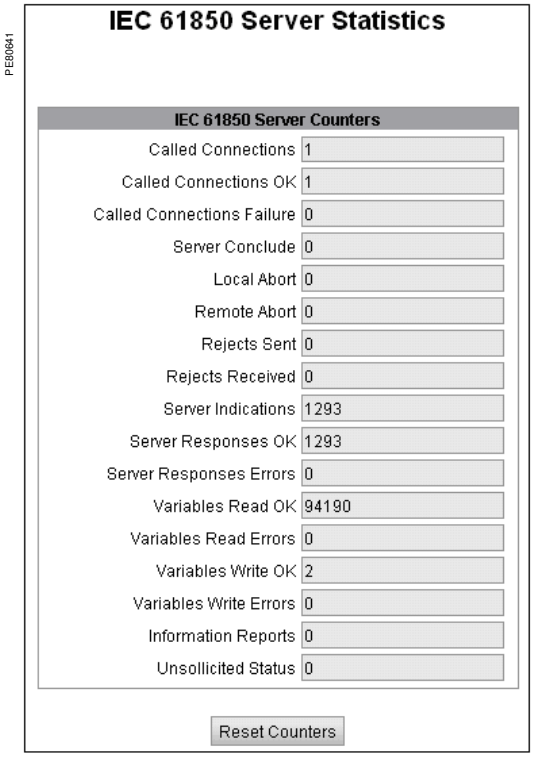

PE80634
Modbus/TCP Connections Statistics
Connections
Index Remote IP Remote Port Local Port Transmitted Messages Received Messages Sent Errors
1 169.254.0.20 4607 502 15801 15802 0
2 169.254.0.20 3213 502 3 3 2
Reset Counters

ACE850 Modbus/TCP connections statistics.

Modbus/TCP connections statistics

Item	Description
Index	Connection number
Remote IP	IP address of the Modbus client
Remote port	TCP port number on the client side
Local port	TCP port number on the server side
Transmitted messages	Number of Modbus requests for this connection
Received messages	Number of Modbus normal responses for this connection
Sent errors	Number of Modbus exception responses for this connection
Reset counters button	Button to reset the Modbus counters

IEC 61850 statistics

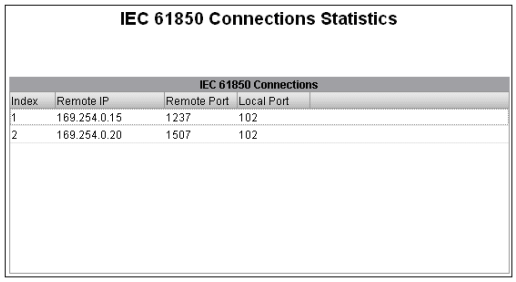


ACE850 IEC 61850 server statistics.

IEC 61850 server statistics

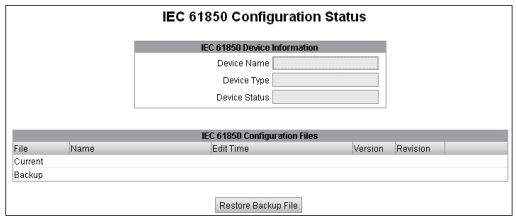
Item	Description
Called connections	Number of incoming connection requests
Called connections OK	Number of accepted incoming connection requests
Called connections failure	Number of rejected incoming connection requests
Server conclude	Number of server initiated conclude operation
Local abort	Number of server initiated abort operation
Remote abort	Number of client initiated abort operation
Rejects sent	Number of reject frames sent
Rejects received	Number of reject frames received
Server indication	Number of incoming server requests
Server responses OK	Number of accepted incoming server requests
Variables Read OK	Number of accepted MMS read variable requests
Variables Read errors	Number of rejected MMS read variable requests
Variables Write OK	Number of accepted MMS write variable requests
Variables Write errors	Number of rejected MMS write variable requests
Information reports	Number of Information reports sent
Unsolicited status	Number of Unsolicited status messages sent
Reset counters button	Button to reset the IEC 61850 counters

PE80642



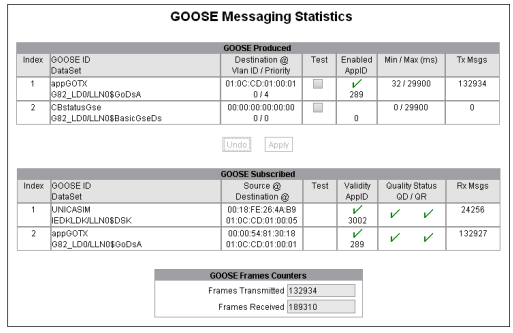
ACE850 IEC 61850 connections statistics.

PE80643



ACE850 IEC 61850 Configuration status.

PE80644



ACE850 GOOSE messaging statistics.

IEC 61850 connection statistics

Item	Description
Index	Number of the connection
Remote IP	IP address of the IEC 61850 client
Remote port	TCP port number on the client side
Local port	TCP port number on the server side

IEC 61850 configuration status

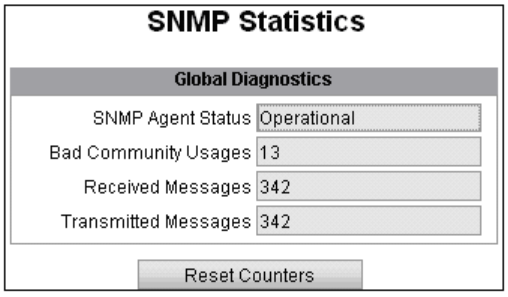
Item	Description
Device information	
Device name	Name given to the device in the IEC 61850 configuration file
Device type	Type of the Sepam as declared in the configuration file
Device status	■ Wrong type: the actual Sepam is not of the expected type ■ Init: the device database is being initialized ■ Online: the device is operational ■ Bad Conf.: there is an error in the configuration file
IEC 61850 Configuration files	
File	"*Current*" is the last loaded CID file "*Backup*" is the archived CID file
Name	Name of the file as defined at loading
Edit time	Time at which the configuration file has been created
Version	Version of the file as defined in the file header
Revision	Revision of the file as defined in the file header
Restore backup file button	Overwrite the content of the current file with the content of the backup file

GOOSE messaging statistics

Item	Description
GOOSE produced (1)	
Index	Number of the produced GOOSE message
GOOSE ID Dataset	Value of the appID field in the GOOSE control block Dataset used for this GOOSE message
Destination @ V-Lan ID / Priority	Mac multicast address for this GOOSE message V-Lan identifier and priority for this GOOSE message
Test checkbox	Value of the GOOSE message test mode flag
Enabled AppID	Enabled status of the GOOSE control block Value of the AppID field in the GSE address block
Min/Max	Minimum and maximum retransmission time
Tx Msgs	Number of such GOOSE messages produced
Undo button	Cancel the changes made to the test checkboxes
Apply button	Apply the changes made to the test checkboxes
GOOSE subscribed (1)	
Index	Number of the subscribed GOOSE message
GOOSE ID Dataset	Value of the GoID field in the received GOOSE message Dataset used for this GOOSE message
Source @ Destination @	Mac address of the GOOSE message producer Mac multicast address for this GOOSE message
Test	Value of the test mode field of the received GOOSE message
Validity AppID	Enabled state of the subscription Value of the AppID field in the received GOOSE message
Quality status: QD	Value of the "quality of data" flag for that message
Quality status: QR	Value of the "quality of reception" flag for that message
Rx Msgs	Number of such GOOSE messages received
GOOSE frames counters (1)	
Frames transmitted	Total number of GOOSE frames transmitted by the device
Frames received	Total number of received GOOSE frames whether they are subscribed or not

(1) *More information can be found on page 95.*

PE80635

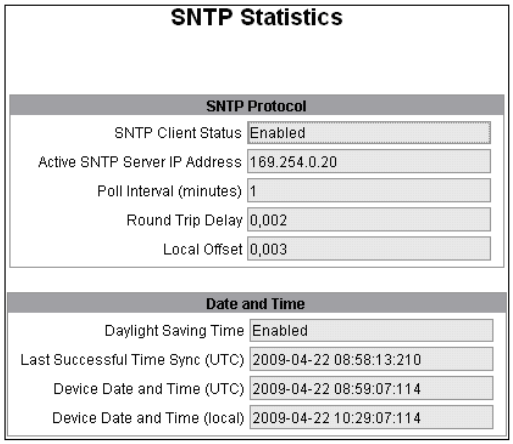


ACE850 SNMP statistics.

SNMP statistics

Item	Description
SNMP agent status	Status of the SNMP agent
Bad Community usages	Number of requests with invalid community
Received messages	Total number of SNMP requests
Transmitted messages	Total number of SNMP responses
Reset counters button	Button to reset the messages counters

PE80636



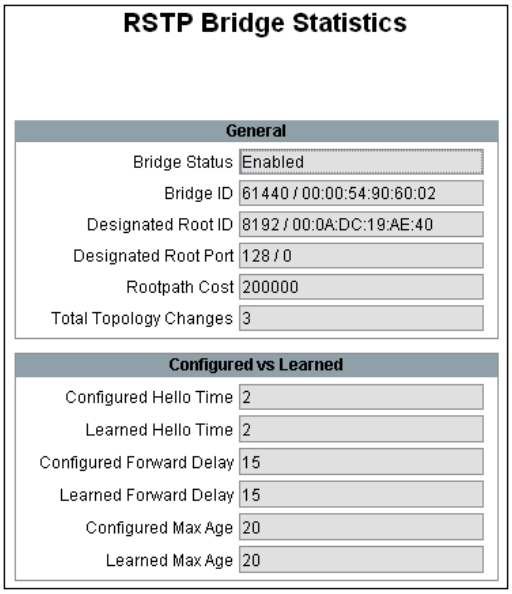
ACE850 SNTP statistics.

SNTP statistics

Item	Description
SNTP Client status	Value configured for the parameter in SFT2841
Active SNTP server IP address	Address of the server currently answering SNTP requests (0.0.0.0 if no server answer)
Poll interval	Value configured for the parameter in SFT2841
Round trip delay	Total time for SNMP request and response messages
Local offset	Difference between SNTP time and ACE time
Daylight saving time	Value configured for the parameter in SFT2841
Last Successful Time Synchronization (UTC)	Last time the ACE850 successfully contacted the SNTP server (UTC time)
Device Date and Time (UTC)	Current time and date of the ACE850 (UTC time)
Device Date and Time (local)	Current time and date of the ACE850 (local time)

RSTP statistics

PE80637

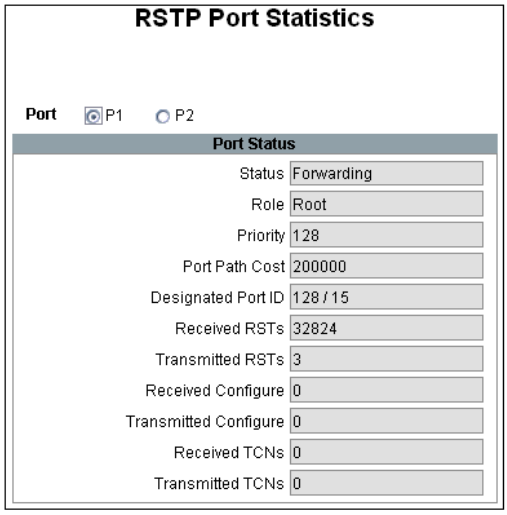


ACE850 RSTP bridge statistics.

RSTP bridge statistics

Item	Description
Bridge status	RSTP status of the bridge
Bridge ID	Bridge vector (Bridge priority/Bridge Mac address)
Designated Root ID	Bridge vector of the RSTP root bridge
Designated Root Port	Identifier of the root port (priority/number)
Rootpath cost	Path cost to the root
Total topology changes	Topology change counter (as defined by 802.1D-2004)
Configured hello time	Value of the configured hello time
Learned hello time	Operational value for hello time
Configured forward delay	Reminder of the configured forward delay
Learned forward delay	Operational value for forward delay
Configured max age	Value of the configured max age
Learned max age	Operational value for max age

PE80638

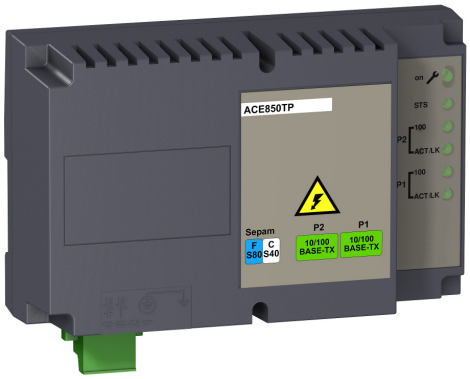


ACE850 RSTP port statistics.

RSTP port statistics

Item	Description
Port P1 / P2 buttons	Selection of the port of which statistics are displayed
Status	RSTP status for the selected port
Role	RSTP role for the selected port
Priority	Port priority
Port path cost	Port contribution to root path cost
Designated port ID	Identifier of the link partner port (priority/number)
Received RSTs	Number of RST BPDUs received (RSTP)
Transmitted RSTs	Number of RST BPDUs sent (RSTP)
Received configure	Number of Configuration BPDUs received (STP)
Transmitted configure	Number of Configuration BPDUs sent (STP)
Received TCNs	Number of Topology change BPDUs received (STP)
Transmitted TCNs	Number of Topology change BPDUs sent (STP)

PB105301



ACE850TP communication interface.

Installation instructions

The ACE850 communication interface must be installed and connected in accordance with the instructions in the following documents:
- ACE850 installation guide (delivered with each ACE850), reference BBV35290,
- Sepam series 40 user's manual, reference PCRED301006EN,
- Sepam series 80 operation manual, reference SEPED303003EN.

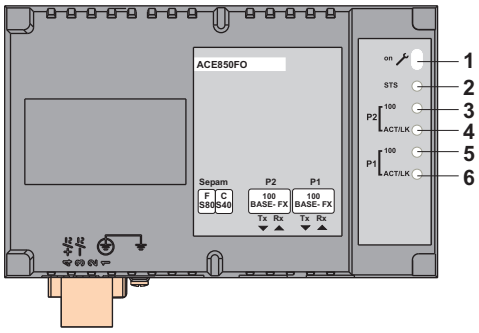
Preliminary checks

Perform the following actions:
- check the CCA614 cord connection between the ACE850 interface and the Sepam base unit
- check the connection of the ACE850 to the Ethernet network
- check the auxiliary power supply connection
- check the complete configuration of the ACE850.

Checking the operation of the ACE interface

You can use the following to check that an ACE850 interface is operating correctly:
- the indicator LEDs on the front panel of the ACE850
- the information provided by the SFT2841 software connected to Sepam
- the web pages embedded inside the ACE850 (this advanced diagnostics feature is only available when it is possible to establish an Ethernet connection with the ACE850. If not, use the basic diagnostics to help solving the problems).

DE80432



ACE850 communication interface.

Basic diagnostics

Diagnosis using indicator LEDs on the ACE850

1 On/fault indicator. This indicator has the following states:
- Off: the module is not powered
- steady red: the ACE850 is initializing or is faulty
- blinking red: the ACE850 is unable to establish communication with the Sepam base unit, or the ACE850 is not properly configured
- steady green: the ACE850 is operating correctly
- fast blinking green: indicates a transient state which occurs at startup when IEC 61850 configuration file is analyzed
- steady green and blinking red: communication with the base unit has been lost. This can indicate a normal situation due to a restart of the Sepam after parameters have been downloaded. The ACE850 automatically resumes normal operation in a few seconds.

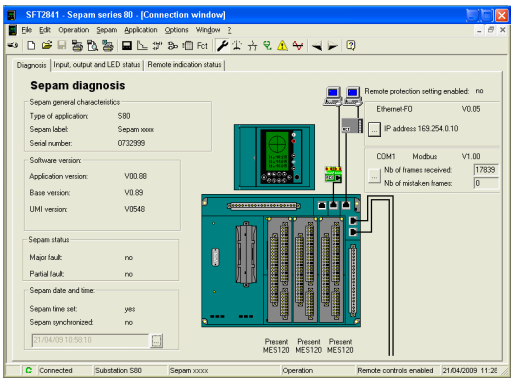
This status can also indicate an error condition, in which case, ACE850 restarts automatically within 15 seconds and try to re-establish connection.

2 Status indicator. This indicator has the following states:
- Off: the Ethernet communication is not started
- steady green: the Ethernet communication is correctly operating
- three blinks pattern: no logical Ethernet link
- four blinks pattern: duplicate IP address
- six blinks pattern: invalid IP configuration.

3 and **5** Speed indicators. These indicators have the following states:
- Off: the corresponding physical link is down or the port speed is 10Mbps
- On: the corresponding port operates at 100Mbps.

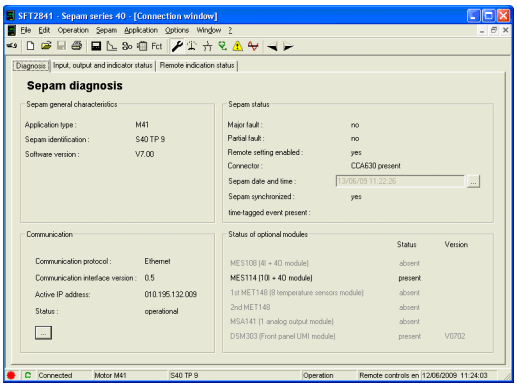
5 and **6** Link/Activity indicators. These indicators have the following states:
- Off: the corresponding physical link is not established
- On: the corresponding physical link is established
- blinking: the indicator blinks with the activity on the link.

PE80401



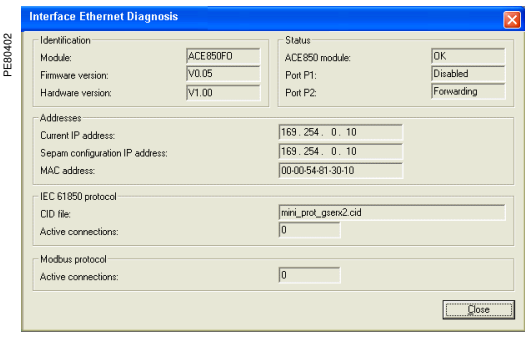
SFT2841: Sepam series 80 diagnosis screen.

PE80482



SFT2841: Sepam series 40 diagnosis screen.

PE80402



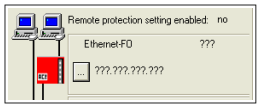
SFT2841: Ethernet diagnosis screen.

Diagnosis using SFT2841 software

When connected to Sepam, the SFT2841 software informs the operator of the general Sepam status and of the Sepam communication status in particular. Sepam status information appears on the Sepam diagnosis screen on which buttons can be used to obtain detailed status information on each communication channel. The Sepam diagnosis screen can be used to check that the Sepam base unit and the ACE850 interface are correctly connected:

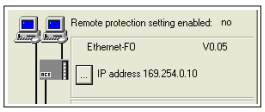
Sepam series 80

PE80405



Diagnosis screen detail:
ACE850 not or improperly connected.

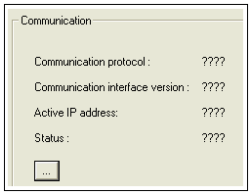
PE80406



Diagnosis screen detail:
ACE850 connected properly.

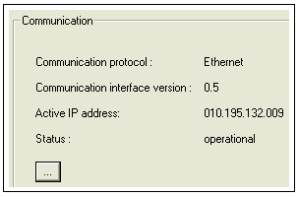
Sepam series 40

PE80484



Diagnosis screen detail:
ACE850 not or improperly connected.

PE80485



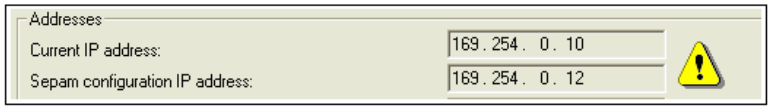
Diagnosis screen detail:
ACE850 connected properly.

Detailed diagnosis

The Ethernet diagnosis screen allows to check:
- the ACE850 has accepted its configuration (status = OK)
- the communication ports status
- the IP address used by the ACE850.

If different from the one configured, it might mean that the configured address is not valid, or that it is overridden by the CID file, if allowed.

PE80645



Troubleshooting

ACE850 and Ethernet troubleshooting

Symptoms	Possible cause	Action/Remedy
On/Fault LED is not lit.	Source power is not applied or is not stable.	Apply power or check source.
	LED is burned out.	Check to see if other LEDs operate properly.
On/Fault LED is steady red.	The module is in a faulty condition.	Try to power off and on again. If condition persists, replace the module.
On/Fault LED is blinking red.	The link with Sepam base unit is broken.	1. Check that the ACE850 is declared in Sepam configuration. 2. Check the cabling between Sepam and ACE850.
P1/P2 link LED is not lit.	Proper link is not established.	1. Make sure the proper cable is used and connected. 2. Make sure the proper media type is selected in the ACE850 Communication setup configuration.
Status LED repeats a four blink-pause pattern.	The IP address that the ACE850 was assigned is being used by another networked device.	Assign a new IP address to the ACE850 or to the conflicting device. ***Note:*** *When a duplicate IP address is detected, the ACE850 resets its specified IP address to the default IP address. When the ACE850 detects the conflict no longer exists, it will use the specified IP address.*
Status LED repeats a three blink-pause pattern.	No Ethernet connection can be established. ***Note:*** *if RSTP is enabled, this is a normal transient situation for approximately 20/30 seconds after startup.*	Check that at least one of the P1 or P2 link is established.
Cannot browse the ACE850.	Incorrect network configuration.	1. Verify all IP parameters are correct. 2. Verify ACE850 receives request by pinging the ACE850: ■ go to DOS prompt ■ type `ping` and the ACE850 IP address, e.g `ping 169.254.0.10` 3. Verify all the browser Internet option connection settings are correct.

IEC 61850 configuration troubleshooting

Symptoms	Possible cause	Action/Remedy
IEC 61850 clients can not connect to the ECI850.	Ethernet setup is not correct.	See above.
	The maximum number of active connections is reached.	Check the active clients.
IEC 61850 clients connect to the ACE850, but no data is available.	The IEC 61850 server is not configured or the CID configuration file is not valid.	Download a valid configuration file.
The ACE850 seems working, but does not report data.	The actual Sepam type is not the type expected in the configuration file.	Check on the web server that the configured Sepam type matches the actual Sepam type and update the configuration file as necessary.

Configuration of IEC 61850 protocol
Introduction

Configuration files

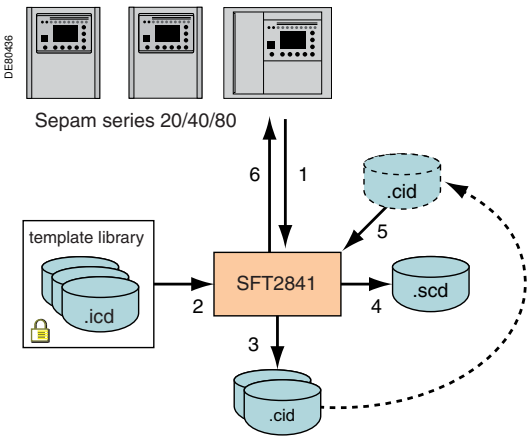
The IEC 61850 configuration process uses and generates the following types of Substation Configuration Language (SCL) files:

SCL file	Description
ICD IED (Intelligent Electronic Device) Capability Description	An ICD file exists for each type of Sepam device. It describes the functions and communication data available in a Sepam. ICD files are provided in a library with SFT2841 and SFT850 configuration tools, and are used as device models in the configuration process.
IID Instantiated IED Description	The IID file describes the project-specific configuration of a single IED in a system. It is used as an exchange file between the SFT850 configuration tool and other IEC 61850 system configuration tools to exchange the configuration data for a single IED instantiated specifically for a project.
CID Configured IED Description	For every configured Sepam or ECI850 device there is a CID file which describes the operating IEC 61850 configuration of the device. A CID file is created when a device is configured with the configuration tools. The CID file is then loaded into the device to configure it. In the case of an ECI850, the CID file contains configuration information for all the Sepam devices to which it is connected.
SCD Substation Configuration Description	An IEC 61850 Substation Automation System has an SCD file. An SCD file contains configuration data for the IEC 61850 system and the communication configuration settings for all related IEC 61850 devices.

Configuration of IEC 61850 protocol
Introduction

SFT2841 for standard IEC 61850 configuration

The Sepam setting and operating software, SFT2841, is used to produce a standard IEC 61850 configuration. The standard configuration enables the use of all the communication data of a Sepam without modification, as described in the ICD files.



SCL files with SFT2841.

The SFT2841 is used to:

1 Get the information from Sepam and ECI850 connected to the IEC 61850 network. This can be done manually by keying the Sepam description (name, type, address) or automatically by the SFT2841 polling the network to find connected devices.

2 Extract ICD files from the library to build a configuration based on the Sepam description.

3 Build a CID file as a result of the configuration for each Sepam or ECI850 connected to the IEC 61850 network. For an ECI850, it contains the configuration of all the Sepam connected to the ECI850.

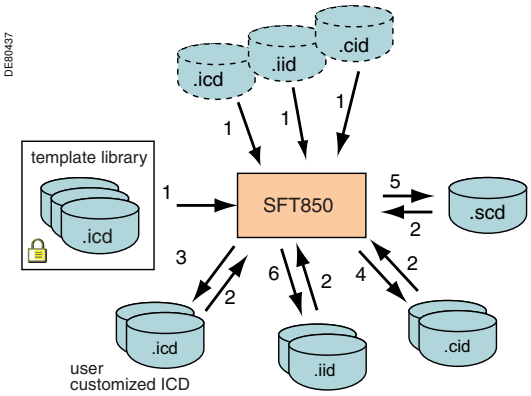
4 Generate an SCD file for use by other IEC 61850 configuration tools. It contains the configuration of all Sepam and ECI850 connected to the IEC 61850 network.

5 Import a CID file into SFT2841 to modify it: for example to add or remove a Sepam in the IEC 61850 network topology.

6 Download a CID file into Sepam or ECI850 with SFT2841.

SFT850 for advanced IEC 61850 configuration

IEC 61850 configuration software SFT850 is used to create, display, modify, or optimize an IEC 61850 configuration.



SCL files with SFT850.

The SFT850 can be used to:

1 Create an IEC 61850 configuration using an ICD, IID, or CID file as an input.

2 Edit an existing CID, SCD, IID, or user-customized ICD file to modify its contents by:
- adding or removing a Sepam
- displaying the configuration
- modifying communication parameter values
- optimizing configuration by creating or modifying Datasets and Report Control Blocks
- configuring or optimizing the GOOSE communication by creating or modifying the GOOSE messages production and subscription.

3 Generate a user-customized ICD file using a Sepam IED template from the factory ICD library.

4 Generate a CID file for storing the configuration of one device which can then be downloaded to the Sepam or ECI850 server using SFT2841 or by FTP with a standard Internet browser software.

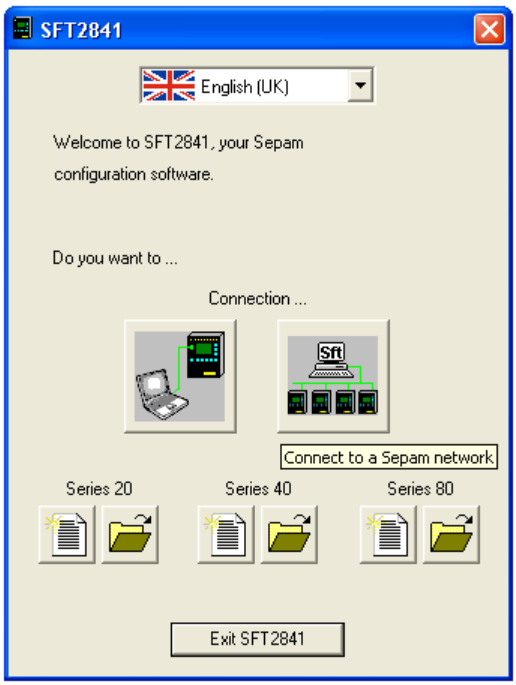
5 Generate an SCD file for storing the configuration of an IEC 61850 system which can then be used by other IEC 61850 configuration tools.

6 Generate an IID file for storing the specific configuration of an instantiated IED which can then be used by other IEC 61850 system configuration tools.

Note:
The CID or SCD file can come from the SFT2841. Sepam ICD Factory library templates can not be modified.

Configuration of IEC 61850 protocol
With SFT2841 setting and operating software

PE80066



SFT2841 welcome window.

Introduction

The SFT2841 software provides a quick and easy way to generate all the standard configuration files that describe the IEC 61850 access to Sepam devices according to standard IEC 61850-6. These files are:

- The ECI850 CID file that describes the communication and data interface to all Sepam attached to the server as Logical Devices.
- The CID file for the Sepam series 40 and Sepam series 80 fitted with the ACE850 communication interface.
- The SCD file that gives the complete description of the whole IEC 61850 communication system and that can be used as input to configure the SCADA system.

The SFT850 configuration software provides all necessary functions for an advanced IEC 61850 configuration. SFT2841 supports only a standard IEC 61850 configuration with predefined device capabilities (predefined Datasets and Report Control Blocks).

To configure an IEC 61850 Sepam communication system using SFT2841, follow these steps:

1. Create a Sepam communication network
2. Add the Sepam and ECI850 devices to the network
3. Generate the CID files, and optionally, the SCD file
4. Load the CID files into the devices

Sepam communication network

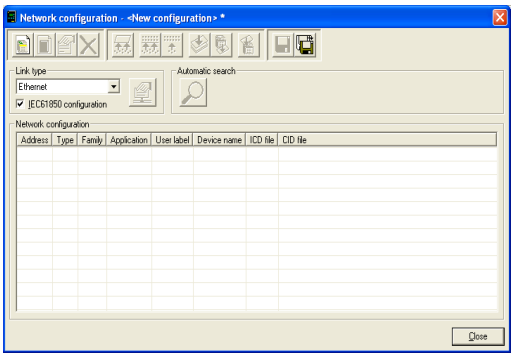
SFT2841 can be connected to Sepam either locally in point-to-point mode, or in multipoint mode via a communication network called E-LAN (Engineering Local Area Network).

First the definition of a Sepam communication network is described in a configuration file (NET file) with SFT2841.
Then the Sepam devices can be addressed by SFT2841 via the E-LAN and constitute a Sepam communication network.

In an IEC 61850 system based on Ethernet TCP/IP, the E-LAN uses the same Ethernet TCP/IP communication network. Therefore, this network configuration (defined in a NET file) can be successfully adapted to include the full description of the IEC 61850 Sepam devices profiles, thus creating their CID files.

SFT2841 is able to load into the Sepam devices and ECI850 their CID file via the Ethernet network.

PE80067



Network configuration.

Creating a Sepam communication network

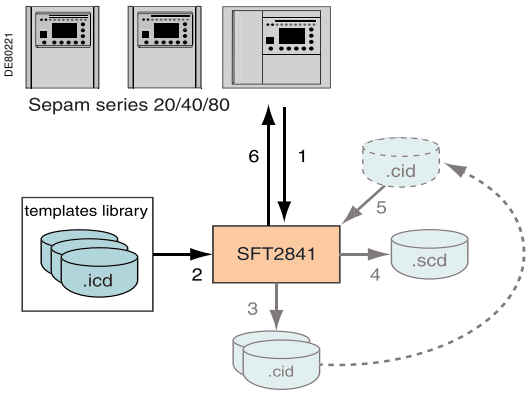
When creating a Sepam communication network (NET file) with SFT2841, 3 types of communication link are possible:

- Serial
- Phone modem
- Ethernet

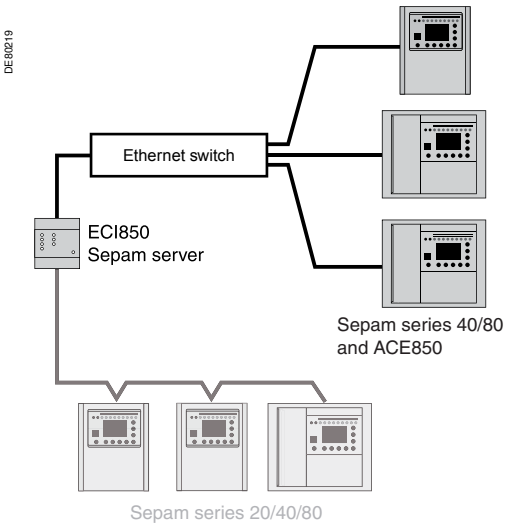
To create an IEC 61850 Sepam network do the following steps:

1. Select **Ethernet** because IEC 61850 is based on Ethernet TCP/IP protocol over Ethernet network.
2. Select the option **IEC 61850 configuration**.
This option enables a set of functions that are used during the IEC 61850 configuration process.

Configuration of IEC 61850 protocol
With SFT2841 setting and operating software

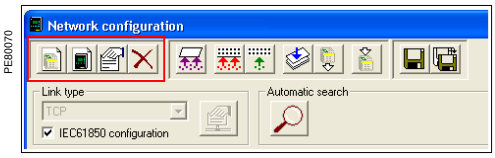


Adding devices to the network.



Adding an Ethernet TCP/IP device.

Adding devices



Device editing functions.

Device editing functions

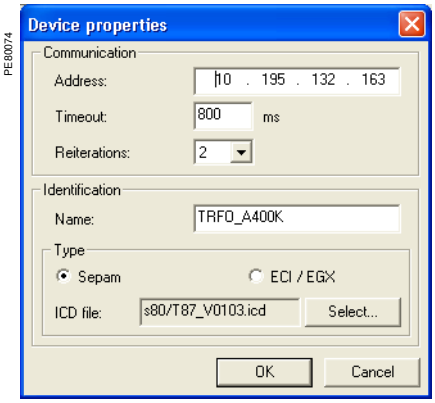
To define the devices to be connected on the network, 4 options are available:
- Add an Ethernet TCP/IP device
- Add a device on an ECI850
- Modify a device
- Remove a device from the configuration

These actions are also available from a contextual menu.

Adding an Ethernet TCP/IP device

To add an Ethernet TCP/IP device (ECI850 or Sepam series 40/80 and ACE850):

1. Click on the button to display the following Device properties window.



2. Set the fields of the Device properties window according to following description.

Communication settings
- Address

Assign an IP address to the device.
This address is used by SFT2841 to access the device for loading the CID file. This address must match the IP address assigned locally to the device. It must be unique on the Ethernet TCP/IP network.
- Timeout and Reiterations

These parameters are related to the communication between SFT2841 and the device when SFT2841 is used in multi-point mode via the E-LAN. They have no impact on the IEC 61850 configuration. Default values should be kept.

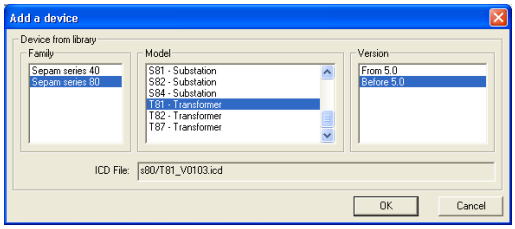
Device identification
- Device name

The device name is the name of the IED in the IEC 61850 system. It must be unique in the IEC 61850 system.
- ICD file
- Device type

For a Sepam series 40 or Sepam series 80 device, set the type to Sepam. For an ECI850, set the type to ECI/EGX.
- ICD file

Select the ICD file that provides the IEC 61850 description of the device.
SFT2841 software is delivered with a library of ICD files for all types of Sepam devices and all Sepam applications. This library also includes the ICD file for the ECI850.

Configuration of IEC 61850 protocol
With SFT2841 setting and operating software



Browsing the library and device selection.

Selecting a device in the library

SFT2841 displays the list of IEC 61850 devices available in the library.
To browse inside the ICD library, use the 3 access keys: Family, Model and Version.

1. Select the Family you wish.

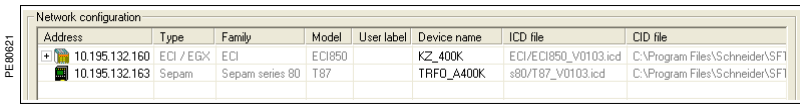
Then the Model defines a device within the Family.
For instance, the Family Sepam series 80 includes the following Models:

- Substation S80, S81, S82, S84
- Transformer T81, T82, T87
- Generator G82, G87, G88
- Motor M81, M87, M88
- Busbar B80, B83
- Capacitor C86

2. Select the Model you wish.
3. For a given Model, select the Version.

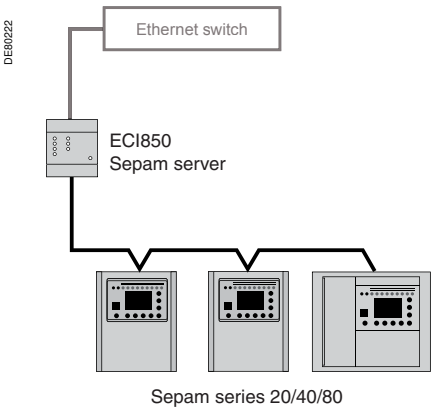
The correct ICD file associated with the device is automatically selected.

The new device is added to the devices table and all its main characteristics are displayed.



Ethernet TCP/IP devices added on the devices table.

The ECI850 is represented by the following icon: .
A Sepam is represented by the icon: .



Adding an Ethernet TCP/IP device.

Adding a Sepam on the ECI850

This option is enabled only if an existing ECI850 is selected in the devices table.

To add a Sepam:
1. Click on the button .
2. Set the fields of the device settings window according to following description.

Properties

- Address

Assigning a Modbus address to the device from 1 to 247.
This address is used by the ECI850 to access the device as a slave device via the Modbus subnetwork. It must be unique on the Modbus subnetwork.

- Device name

Assigning a name to the device.
Each Sepam attached to the ECI850 will be considered as a Logical Device (LD) according to the IEC 61850 standard. The name of the device will be the name of the LD inside the ECI850. It must be unique inside the server.

- ICD file

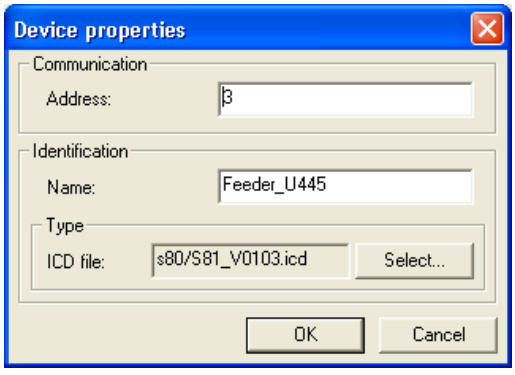
Selecting the ICD file that provides the IEC 61850 description of the device.

Selecting the device in the library

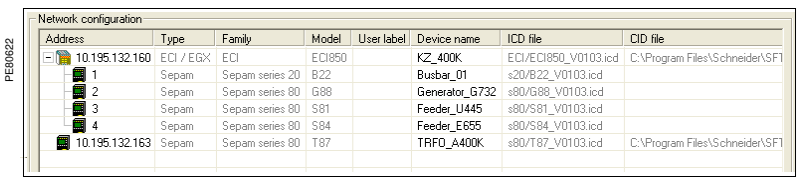
To select the ICD file that provides the IEC 61850 description of the device, follow the same process as described for an Ethernet TCP/IP device, browsing inside the ICD library with the 3 access keys: Family, Model and Version.

The Family depends on the device type so select the Model, then select the Version.

When the action is complete, the new Sepam is added to the devices table and all its main characteristics are displayed.



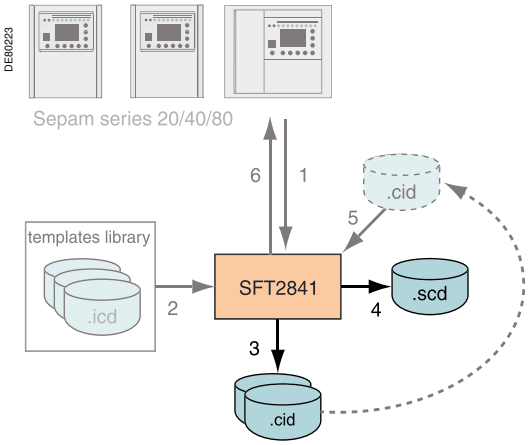
Sepam device settings window.



Sepam devices added on the devices table.

The ECI850 is represented by the following icon: .
A slave Sepam connected to an ECI850 is represented by the icon and a link to the ECI850 icon.

Configuration of IEC 61850 protocol
With SFT2841 setting and operating software



Generating CID and SCD files.

Generating the CID files and the SCD file

After the devices have been added to the IEC 61850 communication network, SFT2841 can generate the CID file of a specific device or all the CID files for all IEC 61850 devices defined on the network. SFT2841 can also generate the SCD file that describes the Sepam communication network as an IEC 61850 communication system.

3 functions are available to generate the CID files and the SCD files.

To activate these functions, use the following 3 buttons in the toolbar:

Generating a specific CID file

To generate the CID file of a specific device, select the device in the devices table and click on the button .

***Note:** this button is enabled only when an Ethernet TCP/IP device is selected (ECI850, Sepam series 40 or Sepam series 80 directly connected to the Ethernet TCP/IP network).*

A dialog box requests the location and name of the CID file. By default, the name of the CID file is built from the IED name: <IED-name>.cid.

Generating all CID files

To generate all of the CID files for all IEC 61850 devices defined on the network, click on the button .

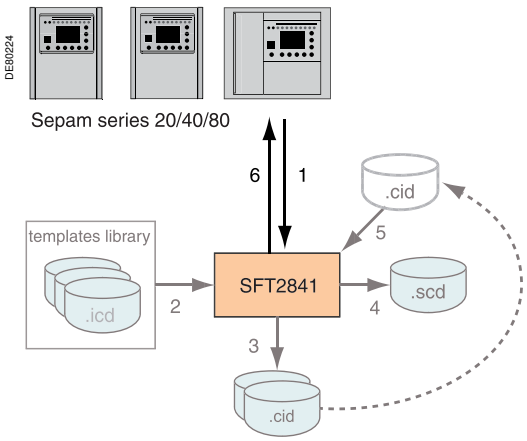
A dialog box requests you to provide the location of the CID files. The name of each CID file is built from the IED name: <IED-name>.cid.

Generating the SCD file

To generate the SCD files for all IEC 61850 devices defined on the network, click on the button .

A dialog box requests the location and name of the SCD file. By default, the name of the SCD file is built from the name of the Sepam NET file: <NET file name>.scd.

Configuration of IEC 61850 protocol
With SFT2841 setting and operating software



Loading a CID file into a device.

Loading a CID file into a device

To load a CID file into a device, select the device from the devices table and click on the button .

***Note:** this button is enabled only when an Ethernet TCP/IP device is selected (ECI850, Sepam series 40 or Sepam series 80 directly connected to the Ethernet TCP/IP network).*

1. A dialog box requests to select the CID file to load.
2. The file transfer from SFT2841 to the device is based on FTP protocol. A dialog box requests your Username and Password in order to establish the FTP connection with the device.

The Username and Password should match those defined in the FTP server embedded in the remote device. Ask your IEC 61850 network administrator for the FTP Username and Password.

3. When the load of the CID file is complete, the connection with the remote device is automatically closed and the following result message "CID file downloaded successfully" is displayed.

Special transfer error cases

The transfer of the CID file is aborted by the device in the following cases:

- The content of the CID file is corrupted

To guarantee the integrity of the CID files, SFT2841 and Schneider Electric devices use a check key. If a CID file is modified using an XML editor or any other editor, the CID file will be considered as corrupted and refused by the device.

- Memory overflow

The device refuses the CID file if there is not enough memory to store it on the device.

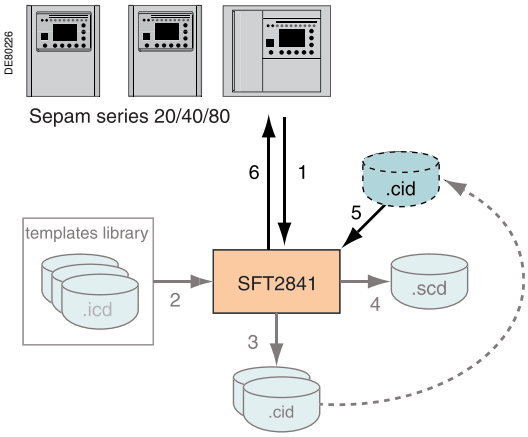
Configuration of IEC 61850 protocol
With SFT2841 setting and operating software

Importing a device configuration from an existing CID file

This function enables the creation of a Sepam communication network by importing CID files. In this case, descriptions of devices are provided by CID files, instead of ICD files.
If the CID file represents an ECI850 Sepam server, all associated Sepam devices will be automatically added to the Sepam communication network.
To import a device from a CID file, proceeds as follow:
1. Add an Ethernet TCP/IP device by clicking the button .
2. Enter the IP address. The other parameters are not needed, as they will be taken automatically from the CID file.

Note: *to import a CID file from a remote device, the address must be the IP address of this device.*

3. When the device is created and appears in the devices table, select it.
4. Then, associate an existing CID file to the selected device. 2 cases are possible:
- The CID file is on the PC.
- The CID file is on the remote device.



Importing a device configuration.

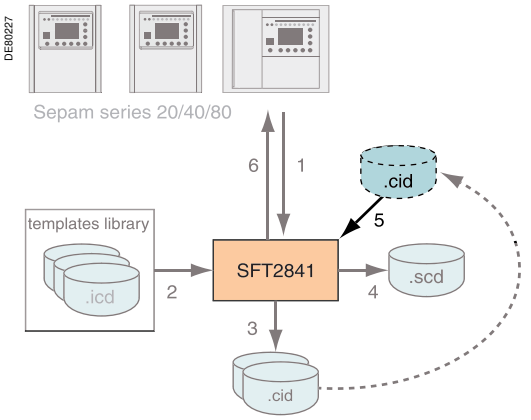
Importing a CID file from the PC

If the CID file is on the PC, click on the button

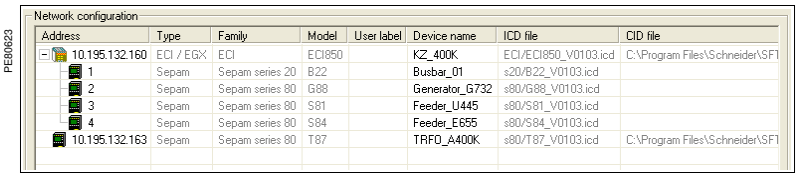
Note: *this button is enabled only when an Ethernet TCP/IP device is selected in the devices table.*

1. A dialog box asks you to select a CID file on the disk.
2. After the CID file has been selected, the description of the device in the devices table is automatically updated with the data taken from the CID file (device type, Family, application, IED name, …).

If the CID file represents an ECI850 Sepam server, all associated Sepam devices will be automatically added to the devices table with their own characteristics (device type, Family, application, IED name, …).



Importing a CID file from the PC.



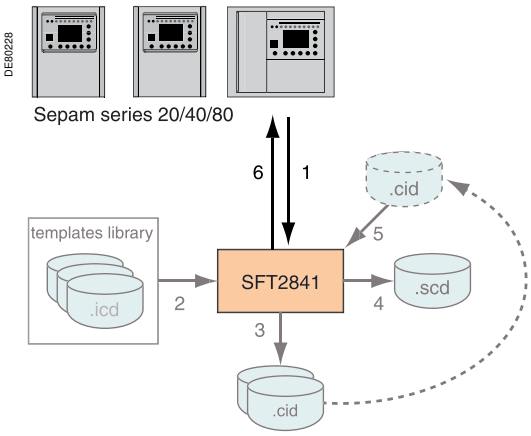
Devices table.

Importing a CID file from a remote device

If the CID file is on the remote device, click on the button

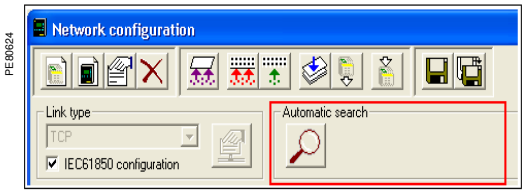
Note: *this button is enabled only when an Ethernet TCP/IP device is selected in the devices table.*

This will initialize a file transfer from the device to SFT2841. This transfer is based on FTP protocol. A dialog box requests your Username and Password.
The Username and the Password should match those defined in the FTP server embedded in the remote device.
When the FTP connection with the device is established, and if a CID file is found on the device, select in which folder the CID file is to be stored.



Importing a CID file from a device.

Configuration of IEC 61850 protocol
With SFT2841 setting and operating software



Creating an IEC 61850 standard configuration by automatic search and identification of Sepam devices

SFT2841 is able to display all information about a Sepam series 40, a Sepam series 80 or an ECI850 connected to the Ethernet TCP/IP network. SFT2841 is also able to display information about all Sepam connected to an ECI850. Using the parameters returned by each device, SFT2841 automatically retrieves its ICD files from the ICD library. The devices table is then updated and the entire Sepam network configuration is ready to build the CID files.

To activate this function click on the following button:

Note: *this button is enabled only when an Ethernet TCP/IP device is selected in the devices table.*

When the function is activated, SFT2841 asks the selected Ethernet TCP/IP device to provide its identification.
When SFT2841 receives the response, it automatically updates the devices table with the data returned by the device (device type, Family, application …). Then, using the version of the Sepam firmware, SFT2841 automatically selects the associated ICD file in the ICD library.

In the devices table, the device identified by SFT2841 is displayed with the following different icons depending on the device type:

- for a Sepam series 40 or a Sepam series 80
- for an ECI850 Sepam server
- for an unknown device

If SFT2841 identifies an ECI850, the function continues and SFT2841 launches the polling of all Sepam devices connected to the server as slave devices. Modbus addresses 1 to 247 are polled. SFT2841 asks each slave device to provide its identification. When SFT2841 receives a response, it automatically updates the devices table with the data returned by the slave device (device type, Family, application …). Then using the version of the Sepam firmware, SFT2841 automatically selects the associated ICD file in the ICD library.

In the devices table, a slave device identified by SFT2841 is displayed with different icons depending on its type:

- for a Sepam device
- for an unknown device

Configuration of IEC 61850 protocol
With SFT850 configuration software

Introduction

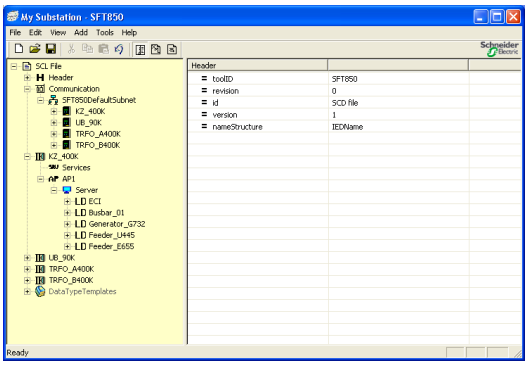
SFT850 software provides a way to create, edit, and display IEC 61850 configuration files which use the Substation Configuration Language (SCL).
In particular, it is used for creating or editing the following files:
- ICD (IED Capability Description)
- IID (Instantiated IED Description)
- CID (Configured IED Description)
- SCD (Substation Configuration Description)

SFT850 enables editing of the CID and SCD files generated by SFT2841 so that the Sepam IEC 61850 configuration can be customized to the needs of the system with more options than SFT2841 provides.
This section presents the main characteristics of the SFT850 software. For more information, refer to the SFT850 User's manual.

Graphical SCL Editor

SFT850 is a graphical tool that enables to browse an SCL file using a tree view that displays the content of the file in a hierarchical format.

PE80100



Tree view

The following main sections are displayed in the tree view:
- Header and History
- Substation (optional)
- Communication
- List of IEDs
- Data Type templates

Expand each section to obtain more details.

Property view

When an item is selected in the tree view, the property view displays details of the selected item. You can activate editing operations from the toolbar and contextual menu. There are also specific dialog interfaces to help guide you.

General content of an SCL file

Header and History
This section contains the history of the file. SFT850 provides a specific function that allows you to add an entry whenever there is a need to track the modifications made to the file.

Substation
This section describes the functional structure of the electrical substation, identifies the primary devices and their electrical connections and defines the system functionality by attaching Logical Nodes to primary equipment. This section deals with the system configuration only; it is optional in an SCD file and not relevant to a CID file.
When present, the section is displayed by SFT850 but is not editable. It can be hidden using a specific option in the SFT850 User Preferences.

Communication
This section contains the definition of all sub-networks defined in the IEC 61850 system, with the list of the connected IEDs. Both Client/Server and Peer-to-Peer communication access points are displayed.
SFT850 provides specific functions to add, delete a subnetwork, add, remove an IED on a subnetwork, and to set, modify the communication addresses.

List of IEDs
This section contains the definition of all IEDs defined in the IEC 61850 system. Each IED is displayed with all its contents:
- Logical Devices (LD)
- Logical Nodes (LN)
- Datasets (DS)
- Report Control Blocks (RCB)
- GOOSE Control Blocks (GoCB)
- GOOSE Receive

Data Type templates
This section provides the description in detail of all types of data used by the IEDs defined in the configuration: Logical Node Types, Data Object types, Data Attribute types, Enumeration Types.
This section is intended for IEC 61850 experts and is hidden by default, using a specific option in the SFT850 User Preferences.

Configuration of IEC 61850 protocol
With SFT850 configuration software

Adding and removing a device in an IEC 61850 system

Adding and removing a device in an IEC 61850 system consists of making the change in the associated SCD file.

SFT850 manages 2 types of devices:

- IEC 61850 IEDs: ECI850 Sepam server, Sepam series 40 or Sepam series 80.
- Sepam devices as slave devices associated to an ECI850 Sepam server. Such devices are seen as Logical Devices inside the ECI850.

Adding an IED

SFT850 enables the addition of an IED to an IEC 61850 system using its ICD description file, or the addition of a device already defined by a CID file.

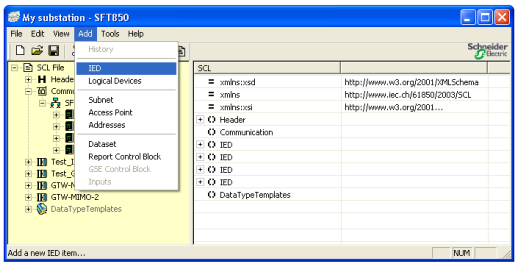
A specific dialog interface requests a name for the IED and then its description. The description is provided from an ICD file, or from a CID file.

As with SFT2841, SFT850 software is delivered with a library of ICD files for all types of Sepam devices and all Sepam applications. This library also includes the ICD file for the ECI850.

You can add a Schneider Electric device identified in this library (as with SFT2841, browsing the ICD library is done using 3 characteristics of the device: Family, Model and Version), or add a third party device using an external ICD file.

When the IED is fully identified, the tree view is updated and the new IED appears in the list of IEDs. The content of the current SCD file is updated with all the description data concerning this device.

PE80101

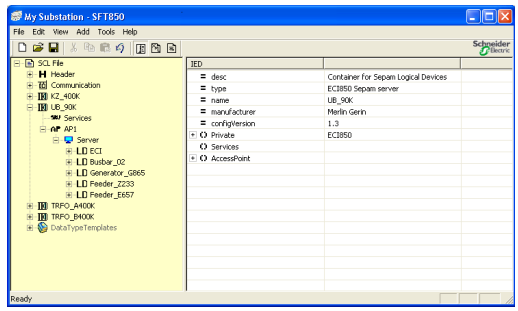


Adding an IED.

Removing an IED

An IED can be removed from an SCD file. This function is available when an IED is selected in the tree view. After you have confirmed that the IED is to be deleted, the tree view and the content of the SCD file are updated.

PE80102



Removing an IED.

Adding a Logical Device (LD)

When an ECI850 Sepam server is selected in the tree view, SFT850 allows the addition of Sepam devices as Logical Devices.

A specific dialog interface requests a name for the LD and then its description. The description is provided from an ICD file of the ICD library. The ICD file is selected depending on the Family, Model and Version of the Sepam to be added.

After the Sepam device is fully identified, the tree view is automatically updated and the new Sepam appears inside the ECI850 as a new Logical Device.

The content of the current SCD file is updated with all the description data concerning this Sepam.

Removing a Logical Device

A Logical Device can be removed from an SCD file. This function is available when a LD is selected in the tree view. After you have confirmed the LD is to be deleted, the tree view and the content of the SCD file are updated.

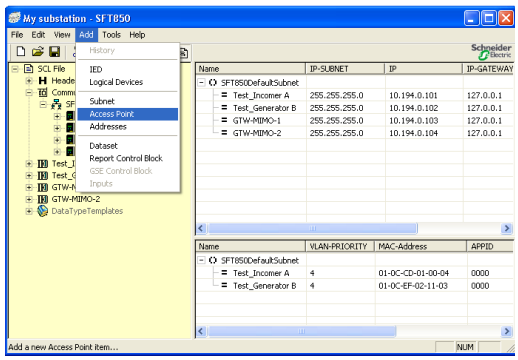
Connecting a device in an IEC 61850 system

An IEC 61850 IED uses an Access Point (AP) to communicate. This AP should be connected to a subnetwork.

SFT850 provides the following set of functions to manage the communication architecture of an IEC 61850 System:

- Adding or removing a Subnet to the system
- Adding or removing an Access Point on a Subnet

PE80103

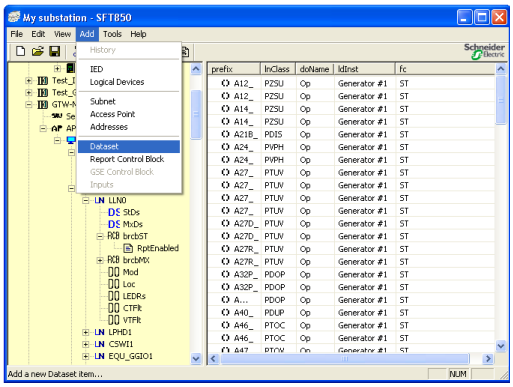


Adding an Access Point.

Editing an IED

The configuration of an IED described in an ICD, CID or SCD file can be modified so that its communication profile and behavior are adjusted to the needs of the system.
Using the SFT850, the user can:
- Create, modify or delete a Dataset
- Create, modify or delete a Report Control Block
- Adjust a dead band
- Create, modify or delete a GOOSE Control Block
- Subscribe to GOOSE messages and assign Sepam GOOSE Inputs

PE80104



Adding a Dataset.

Create, modify or delete a Dataset

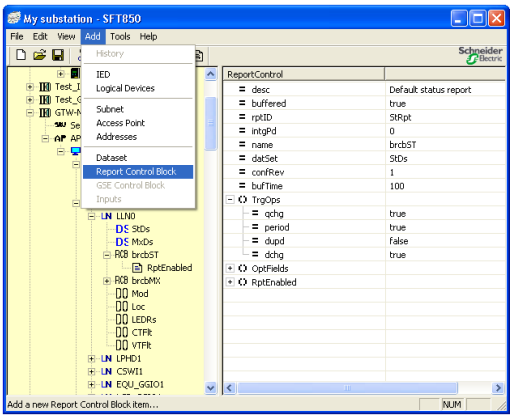
A Dataset is a collection of Data Attributes (DAs) grouped together to increase communication efficiency. In particular, Datasets are used for reports and GOOSE messages.
Any LN instance can contain one or more Datasets depending on the capabilities of the IED.
By default, each Sepam provides 3 Datasets predefined in the ICD file in LLN0:
- StDs: this Dataset includes all status indications provided by all the Protection (or related to protection) Logical Nodes present in Sepam, the Switchgear LN, the Sensor and Monitoring LN, and the Physical Device itself.
- MxDs: this Dataset includes all measurement values provided by all the Measurement Logical Nodes (MMXU) present in Sepam.
- BasicGseDs: this Dataset includes the main indications used for basic GOOSE exchange.

These default Datasets can be modified by the user and new Datasets can be added, depending on the capabilities of the IED.

SFT850 provides an easy way to create or edit a Dataset inside a Logical Node. When creating a Dataset, SFT850 prompts you for its name and description. A specific dialog interface allows you to select which data is to be added to, or removed from the Dataset. The available data that can be selected is displayed in a hierarchical tree with collapse and expand facilities, from their host Logical Node up to their final attributes. Individual and multiple selections are possible.
After completing the definition of the Dataset in the dialog interface, the changes to the Dataset are reflected in the current SCL file and the SFT850 display is updated: a newly created Dataset is displayed in the tree view and a deleted Dataset is removed from the tree view. The content of the Dataset is updated in the property view.

Configuration of IEC 61850 protocol
With SFT850 configuration software

PE80105



Adding a Control Block.

Create, modify or delete a Report Control Block (RCB)

A Report Control Block (RCB) defines the way a Dataset is transmitted to a client.
An RCB can be created inside any Logical Node.
Sepam provides both buffered and unbuffered RCBs.
A buffered RCB (BRCB) is dedicated to only one client at a time. If the same report is to be used by more than one client, several reports of this type have to be instantiated in the IED. The instances of a BRCB are identified using a numerical index and are called commonly indexed BRCB.
An unbuffered RCB (URCB) may be used by several clients.
By default, each Sepam provides 2 pre-defined buffered RCBs in the LLN0, each RCB defined with 2 instances.
These 2 RCBs, defined in each Sepam ICD file, are:

- brcbST01 and brcbST02 are the 2 indexed BRCB associated with the StDs Dataset for reporting status indications.
- brcbMX01 and brcbMX02 are the 2 indexed BRCB associated with the MxDs Dataset for reporting measurements.

These default RCBs can be modified by the user and new RCBs can be added, depending on the capabilities of the IED.

SFT850 provides a specific dialog interface for creating or modifying a Report Control Block. When creating an RCB, SFT850 prompts you for the name and description of the RCB. A specific dialog interface allows you to select the Dataset to be associated with the RCB and to define all settings concerning the way the report is generated.
The most common trigger options to define an RCB are:

- Data Change: the Report is triggered by changes to the data
- Quality Change: the Report is triggered by quality changes
- Periodic: the Report is triggered periodically, according to an Integrity period you specify.

After completing the definition of the RCB in the dialog interface, the changes to the RCB are reflected in the current SCL file and the SFT850 display is updated: a newly created RCB is displayed in the tree view and a deleted RCB is removed from the tree view. The settings of the RCB are updated in the property view.

Adjusting the dead band of measurements

Sepam produces a lot of measurements that are accessible via the IEC 61850 communication interface as Measured Values (MV) and Complex Measured Values (CMV).
To optimize the network bandwidth, it is possible to create a Dataset of measurements and to send it on data changes only, rather than periodically.
Sepam and SFT850 use the dead band parameter (db) defined by the IEC 61850 standard for the MV and CMV to control the conditions for generating reports.
SFT850 allows you to set the dead band of each value for MV and CMV data produced by Sepam. If the data is associated with a Dataset and an RCB with the Data change trigger option, a report will be generated only when the value of the data exceeds the dead band. If the data change is less than the dead band, no report will be generated.

Configuration of IEC 61850 protocol
With SFT850 configuration software

Create, modify or delete a GOOSE Control Block (GoCB)

The GOOSE message service is an efficient real-time communication service for peer-to-peer exchanges between IEDs.
A GOOSE Control Block (GoCB) defines the way a Dataset is transmitted in a GOOSE message. A GoCB can only be created inside the Logical Node 0 (LLN0). The capabilities of an IED regarding the configuration of GoCBs are defined in its ICD file. For Sepam devices, only Sepam series 80 IEDs implement the GOOSE communication service.
By default, each Sepam series 80 IED provides 1 GoCB defined in the LLN0. This GoCB is pre-defined in each Sepam series 80 ICD file. It is named gcbBasicGse and is associated with the BasicGseDs Dataset.
This default GoCB can be modified by the user and new GoCBs can be added, depending on the capabilities of the IED.

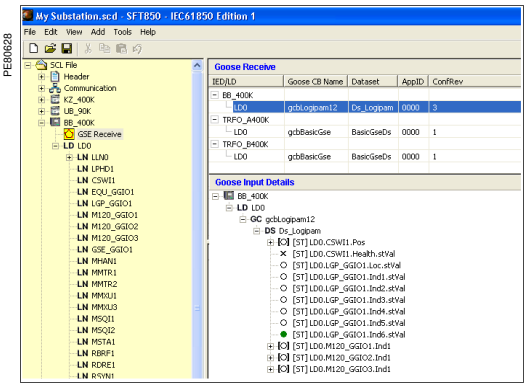
SFT850 provides a specific dialog interface to create or modify a GOOSE Control Block. When creating a GoCB, SFT850 prompts the user for a name and description. A specific dialog interface allows the user to select the Dataset to be transmitted as a GOOSE message. Then, the user needs to enter the settings for publishing the GOOSE message. This includes:
- multicast address the GOOSE message must be transmitted to
- time for the first reiteration of the GOOSE message
- maximum period of production (heartbeat cycle time)

After completing the definition of the GoCB in the dialog interface, the changes to the GoCB are reflected in the current SCL file and the SFT850 display is updated: a newly created GoCB is displayed in the tree view and a deleted GoCB is removed from the tree view. The GoCB settings are displayed in the property view.

Subscribe to GOOSE messages and assign Sepam GOOSE Inputs

The capability of a Sepam IED to receive GOOSE messages is defined in its ICD file. In this case, a GOOSE Receive element is defined at the beginning of the IED section, in the tree view displayed by SFT850. For Sepam devices, only Sepam series 80 IEDs implement the GOOSE communication service.
Editing the GOOSE Receive element allows the user to:
- select the GOOSE messages and the data to which the IED must subscribe
- assign the subscribed data to Sepam GOOSE inputs.

PE80628



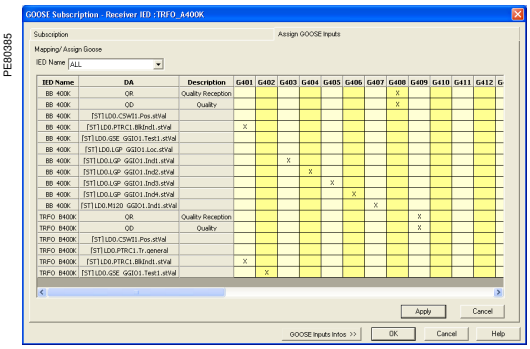
GOOSE Receive element.

SFT850 provides a specific dialog interface to edit the GOOSE Receive element of a Sepam series 80. The dialog is organized in 2 parts:
- GOOSE message and data subscription
- Sepam GOOSE Inputs assignment

GOOSE message and data subscription

This dialog interface displays the list of all GOOSE messages produced on the network and allows you to select the ones the IED must receive. Each GOOSE message can be expanded to see its content: the Dataset conveyed by the GOOSE message is displayed up to the final Data Attributes (DA). The dialog interface allows you to select which DA you want to subscribed to.

PE80385



Sepam GOOSE Inputs assignment.

Sepam GOOSE Inputs assignment

This dialog interface allows you to assign the subscribed DAs to the Sepam GOOSE Inputs.
Sepam provides 32 GOOSE inputs that can be used as binary inputs by Sepam control logic functions:
- 31 GOOSE Inputs, named G401 to G416 and G501 to G515, are free for assignment;
- GOOSE Input G516 is reserved for the ACE850 module presence detection.

An assignment table gives in rows the list of all the subscribed DAs and in column the list of the Sepam GOOSE inputs to which the DAs can be assigned/de-assigned. Assignment/de-assignment is done by selecting the appropriate cells in the table. Several DAs can be assigned to the same Sepam GOOSE input. In this case, Sepam applies a wired-OR logic operation to these DAs.

Configuration of IEC 61850 protocol
With SFT850 configuration software

Generating CID files

When an SCD file is open, SFT850 generates of the CID file of a specific IED or all the CID files for all IEDs defined in the SCD file.

Generating a CID file

This function is available when an IED is selected from the tree view and when this IED is connected to a subnet. A specific dialog interface box asks you to enter the location and the name of the output CID file. By default, the name of the CID file is based on the name of the IED.

Generating all CID files

This function is available when the SCD file includes at least one IED that is connected to a subnet. A specific dialog interface box asks you to enter the location of the output CID files.
The name of each CID file is based on the name of the IED.

Editing a CID file

SFT850 allows the editing of an existing CID file.
This CID file is an advanced configuration file generated during a previous use of SFT850, or a standard configuration file generated by SFT2841.
When editing the CID file of an ECI850, you can use all of the advanced editing functions described below:
- Add, remove a Logical Device inside the ECI850
- Create, modify or delete a Dataset
- Create, modify or delete a Report Control Block
- Adjust the dead band of the measurements

When editing the CID file of a Sepam series 40 or a Sepam series 80, you can use all of the advanced editing functions described below:
- Create, modify or delete a Dataset
- Create, modify or delete a Report Control Block
- Adjust the dead band of the measurements
- Create, modify or delete a GOOSE Control Block (for Sepam series 80)

Editing a GOOSE Control Block or the Dataset associated to a GoCB may lead to incoherence with the definition of the GOOSE message expected by the consumer IEDs. Therefore it is recommended to deal with GOOSE configuration when editing an SCD file, and not a CID file.
Modifying the GOOSE subscription requires to have the description of the IEDs that publish GOOSE messages. Therefore when editing a CID file, SFT850 does not allow modifying the GOOSE Receive element of the IED.

Validating an SCL file

The Validate function includes 2 kinds of verification:
- Verification of the structure and content of the SCL file

The Substation Configuration Language is based on XML. The structure and content of an SCL files is fully specified by the IEC 61850 standard using an XML Schema (XSD files).
SFT850 is delivered with the set of XSD files defined by the IEC 61850 standard. Using the Xerces parser, SFT850 checks the validity of SCL files against the IEC 61850 XML Schema.
- Verification of the consistency of the GOOSE communication

The Dataset sent via GOOSE messages must meet a specific size constraint. The data sent by a producer IED must be consistent with the data expected and subscribed by the consumer IED.
SFT850 checks the size and the consistency of the data exchanged via GOOSE messages.

SFT850 provides 3 ways to validate an SCL file:
- Automatic validation at file opening
- Automatic validation at file saving
- Explicit validation triggered by the user at any time when editing the file

Automatic validation is enabled or disabled using a specific option in the SFT850 User Preferences.

Export to SFT2841

SFT2841 is the setting tool for Sepam devices. It gives access to Sepam devices via Ethernet TCP/IP and may be used to identify the Sepam devices connected to the network and to load the associated CID files.
For that purpose, SFT2841 uses a configuration file named "NET file" which contains:
- the IP address of each Sepam,
- the reference to its CID file,
- the identification of the originating ICD file from the Sepam ICD library.

When an SCD file is open, the Export to SFT2841 function allows you to generate the NET file and the CID files for all the connected IEDs defined in the SCD file. This function is available when the SCD file contains at least one connected IED.

A specific dialog interface prompts you to enter the location of the NET file. The name of the NET file is the same as the name of the SCD file, with the .scd extension changed to .net. The NET file is created in the specified output directory.
A CID sub-directory which contains all the CID files for the IED declared in the NET file is created.
The Export to SFT2841 provides a ready-to-use NET file for SFT2841 that allows addressing Sepam easily for CID transfer (see below).

Transferring a CID file

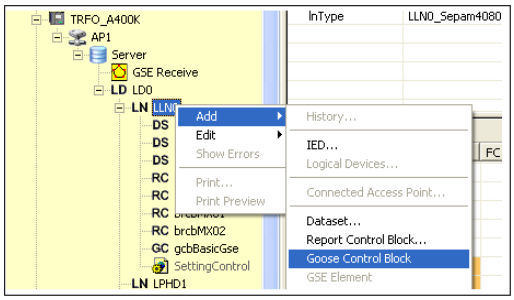
A CID file contains all the IEC 61850 configuration information needed for a Sepam or an ECI850. The transfer of a CID file is performed on Ethernet TCP/IP and based on FTP protocol. There are 2 ways to transfer a CID file to Sepam or ECI850:
- Transfer with SFT2841: the transfer is done using the function "Load CID file to device".
- Simple copy with a standard Internet browser connected to the IP address of the Sepam or ECI850 Sepam server.

In both cases the user has to log onto the device with an authorized username and password.

The use of the Export to SFT2841 function provided by SFT850 makes the transfer process by SFT2841 easier for a complete IEC 61850 installation described by an SCD file and when several CID files are to be loaded in several Sepam devices (see above).
The Export to SFT2841 provides a ready-to-use NET file for SFT2841 that allows addressing Sepam easily for CID transfer. Once the Export to SFT2841 is completed, you can open the NET file using SFT2841. All connected Sepam devices defined in the originating SCD file are displayed in a table along with their IP address and the reference to their CID file. To load a CID file into a device, select the device from the devices table and follow the instructions given on page 40.

The CID file is copied at the root of the file system within the device: ftp://<ip address>/.
A back-up copy of the previous CID file is automatically created in the directory `ftp://<ip address>/bak`. You can revert to the previous configuration by copying the back-up file to its previous location.
After the CID file has been correctly transferred, it is automatically taken into account and used by the Sepam or ECI850.

Configuration of GOOSE communication
GOOSE configuration process



Adding a GOOSE Control Block.

GOOSE communication is implemented by Sepam series 80 fitted with ACE850 communication interface.
To configure the GOOSE communication, the following software are used:
- SFT850 software to configure GOOSE communication in the IEC 61850 system
- SFT2841 software to assign GOOSE Inputs to Sepam control and monitoring functions
- As an option, SFT2885 software (Logipam) to design fully customized and extended control logic functions.

Configuration using SFT850 software

Configuring GOOSE communication involves first configuring the publisher that sends the messages and then the subscriber that receives the messages.
The GOOSE communication configuration is saved in an SCD file.

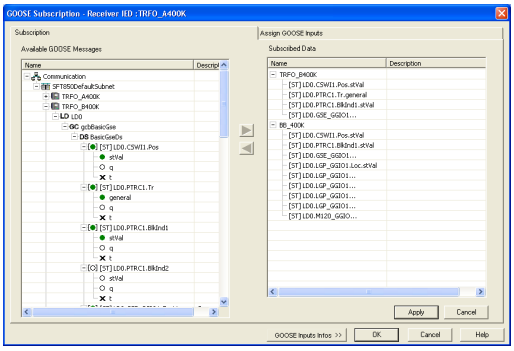
Configuration at Sepam GOOSE publisher side

Procedure

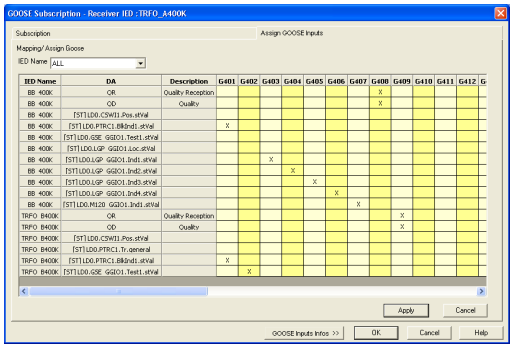
1. Create a Dataset. You can use the predefined BasicGseDs Dataset from the Sepam ICD file, adapt it to meet your application needs or create a new one.
2. Create a GOOSE Control Block to define the publishing of the Dataset as a GOOSE message on the communication network.

There are no specific output variables for GOOSE communication and any data produced by Sepam may be put into a Dataset to be sent via a GOOSE message. Nevertheless, only data from the following types are relevant for GOOSE communication between Sepam devices: Single Point Status (SPS), Double Point Status (DPS) and Quality.

Any Dataset may be attached to a GOOSE Control Block provided its size is compatible with the size of an Ethernet frame. When creating a Dataset, SFT850 calculates the size of the Dataset and informs you if it is GOOSE compatible or not. When creating a GOOSE Control Block, SFT850 allows the selection of GOOSE compatible Datasets only.



GOOSE subscription.



Assigning GOOSE Inputs.

Configuration at Sepam subscriber side

Procedure

1. Select from the published GOOSE messages which Data Attributes (DAs) the device shall subscribe to.
2. Assign subscribed DAs to Sepam GOOSE Inputs.

Sepam provides 32 GOOSE inputs that can be used as binary inputs by Sepam control logic functions:
- 31 GOOSE Inputs, named G401 to G416 and G501 to G515, are free for assignment;
- GOOSE Input G516 is reserved for the ACE850 module presence detection.

Assignment table

The subscribed DAs are asssigned to Sepam GOOSE inputs in an assignment table. The assignment table gives in rows the list of all the subscribed DAs and in column the list of the Sepam GOOSE inputs to which the DAs can be assigned/de-assigned. Assignment/de-assignment is done by selecting the appropriate cells in the table. Several DAs can be assigned to the same Sepam GOOSE input. In this case, Sepam applies a wired-OR logic operation to these DAs.

Quality attributes

2 specific attributes, QR and QD, are available for each GOOSE message. They can be assigned to a GOOSE Input to provide information about the timing and consistency of the message received:
- QR: Quality Reception

If at run time the QR attribute is set to 1, this means that the GOOSE message was not received in the expected time.
- QD: Dataset consistency

If at run time the QD attribute is set to 1, this means that the structure of the GOOSE message is not as expected at subscription time.

Export to SFT2841

When the GOOSE configuration is completed both at publisher and subscriber side, run the Export to SFT2841 function in order to generate from the SCD file, the CID files and the appropriate NET configuration file to be used with SFT2841 (see page 49).

Configuration of GOOSE communication
GOOSE configuration process

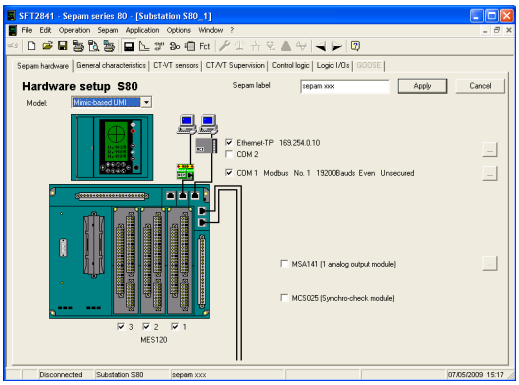
Configuration using SFT2841 software

SFT2841 software is used to configure the ACE850 communication interface and to assign the Sepam GOOSE inputs to control and monitoring functions.
Follow the steps described below:

Configuring the ACE850 communication interface

1. Open the Sepam configuration window in SFT2841,
2. Select the Ethernet communication port
3. Configure the ACE850 communication interface (see page 20).

PE80394



SFT2841: Sepam series 80 hardware configuration.

Assigning the Sepam GOOSE inputs to control and monitoring functions

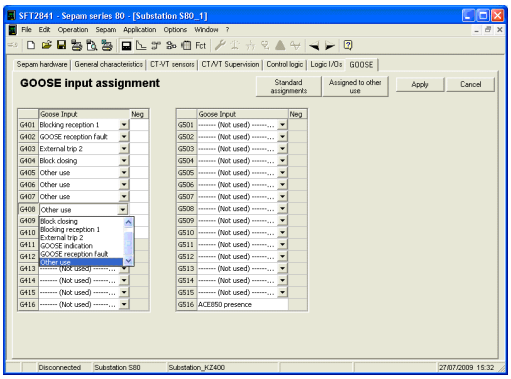
Once the ACE850 communication interface is configured, the GOOSE tab in the Sepam configuration window becomes available.
Select the GOOSE tab to display the GOOSE inputs assignment window.

For each GOOSE input G401 to G416 and G501 to G515, select in the list box a control and monitoring function which the GOOSE input shall be assigned to. The control and monitoring functions available depend on the Sepam application type and are listed in the table below.
A GOOSE input can also be assigned to customized control and monitoring functions designed with SFT2885 software (used to create Logipam programs). In this case, select the **Other use** option in the assignment list box.

GOOSE input G516 is always assigned to the ACE850 presence detection. This assignment cannot be changed.

The control logic of each GOOSE input can be inverted by clicking the associated Neg cell (Negative).

PE80499



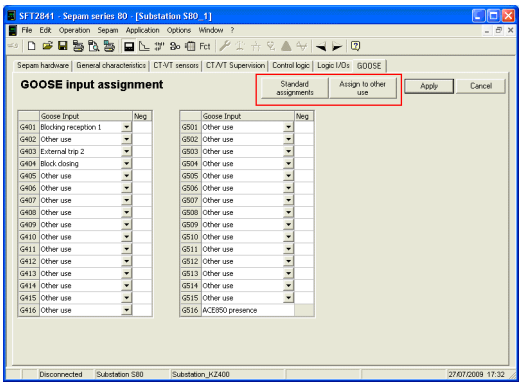
SFT2841: Sepam series 80 GOOSE Inputs assignment.

Available functions for GOOSE Inputs assignment

The following table lists for each Sepam series 80 application, the pre-defined control and monitoring functions that can be assigned to GOOSE inputs.

Functions	S80	S81	S82	S84	T81	T82 T87	M87	M81 M88	G87	G82 G88	B80	B83	C86	Assignment
Blocking reception 1	■	■	■	■	■	■			■	■	■	■		Free
Blocking reception 2			■	■		■			■	■				Free
External trip 2	■	■	■	■	■	■	■	■	■	■	■	■	■	Free
Inhibit closing	■	■	■	■	■	■	■	■	■	■	■	■	■	Free
Load shedding request							■	■					■	Free
GOOSE reception fault	■	■	■	■	■	■	■	■	■	■	■	■	■	Free
GOOSE reception indicator	■	■	■	■	■	■	■	■	■	■	■	■	■	Free
Other use	■	■	■	■	■	■	■	■	■	■	■	■	■	Free
ACE850 presence	■	■	■	■	■	■	■	■	■	■	■	■	■	G516

PE80500



SFT2841: "Standard assignments" and "Assign to other use" buttons.

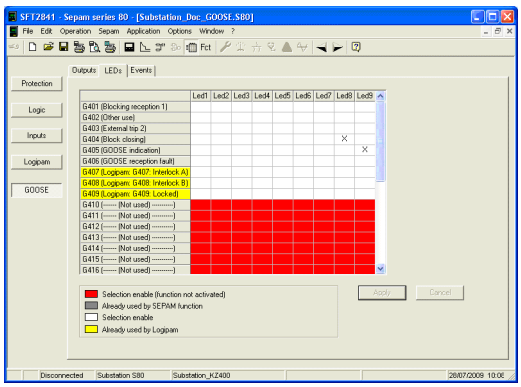
Standard GOOSE inputs assignment

The following table describes the standard GOOSE inputs assignment obtained with SFT2841 when clicking the **Standard assignments** button.

Functions	Standard assignment	Application
Blocking reception 1	G401	All except M87, M81, M88, C86
Blocking reception 2	G402	S82, S84, T82, T87, G87, G82, G83
External trip 2	G403	All
Inhibit closing	G404	All

All other GOOSE inputs are automatically marked "Not used".

PE80501



SFT2841: Using GOOSE Inputs in the control matrix.

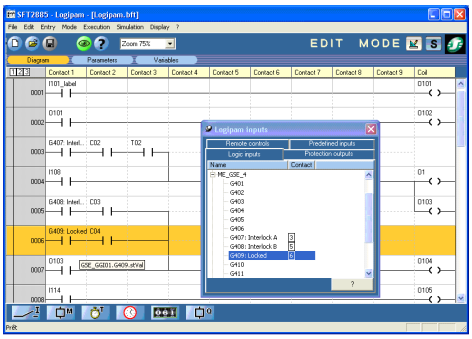
GOOSE inputs assignment to Logipam control and monitoring functions

To assign a GOOSE input to a customized control and monitoring function (Logipam program), select the Other use option in the assignment list box of the GOOSE input. All GOOSE inputs that are not yet assigned to any function (marked "Not used") can be assigned to a Logipam program by clicking the **Assign to other use** button.

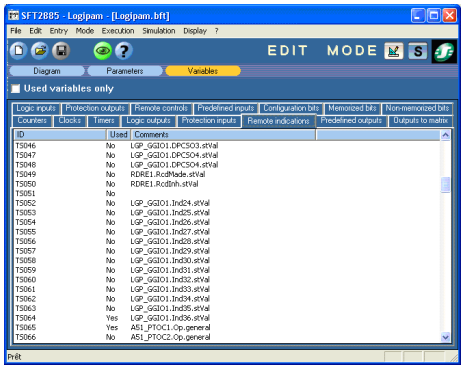
Using GOOSE in the control matrix

All Sepam GOOSE inputs, whether assigned to predefined functions or customized Logipam programs, can be used in the control matrix. The Sepam GOOSE inputs, in the same way as wired logic inputs, can be connected to wired logic outputs or a LED on the front of the Sepam or a message on the local Sepam display.

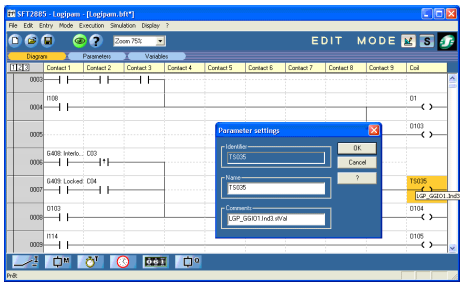
Note: *Sepam GOOSE inputs cannot be used in logical equations.*



SFT2885: GOOSE Inputs in Logipam program.



SFT2885: Variables window (Remote indication tab).



SFT2885: IEC 61850 name of a variable in tool tip and parameter setting dialog box.

Using SFT2885

Logipam Inputs

All Sepam GOOSE inputs can be used with SFT2885 software as binary input variables for the Logipam program in ladder language.
Sepam GOOSE inputs G401 to G416 and G501 to G515 are handled in the same way as wired logic inputs I1xx, I2xx and I3xx from the 3 Sepam MES120 modules:

- They are divided between 2 binary input virtual modules: G4xx and G5xx
- They can be used only in the program contact zone.
- They are updated at the start of each program execution cycle.
- They can be given a name and a comment.

For more details about SFT2885, refer to Logipam User's Manual (SEPED303004EN).
The logic inputs used only in Logipam should be assigned as **Other use** in SFT2841. A GOOSE input that is declared **unused** in SFT2841 is always set to 0.
If a name has been allocated to the GOOSE input in Logipam, this name appears in the input assignment table in SFT2841 instead of **Other use**.

Logipam Outputs

The Logipam program can set 5 types of output variables:

- Binary outputs to MES physical I/O modules)
- Remote indications (status)
- Outputs to control matrix
- Predefined outputs
- Protection inputs

Only remote indications can be put in a dataset to be sent via a GOOSE message.
Most Sepam indications are pre-assigned to protection, control and metering functions. They are available from the Logical Node that implements the functions. For example, the trip indication of the first instance of the time over-current protection comes from A51_PTOC1 Logical Node and is named A51_PTOC1.Op.general.
Some Sepam indications are totally free and can be used without restriction by Logipam program. They are specifically named Logipam indications and are defined in the LGP_GGIO1 Logical Node.
8 Logipam indications are available, named LGP_GGIO1.Ind1 to LGP_GGIO1.Ind8.
Pre-assigned Sepam indications can be re-assigned by the Logipam program if necessary to answer the needs of your installation. When an indication is used by a Logipam program, it is no longer assigned to a predefined function and its meaning is determined by the Logipam program.
64 Sepam indications are specifically defined for that purpose. They are available from a generic Logical Node named S80RI_GGIO1. These indications are named S80RI_GGIO1.TS1 to S80RI_GGIO1.TS64.

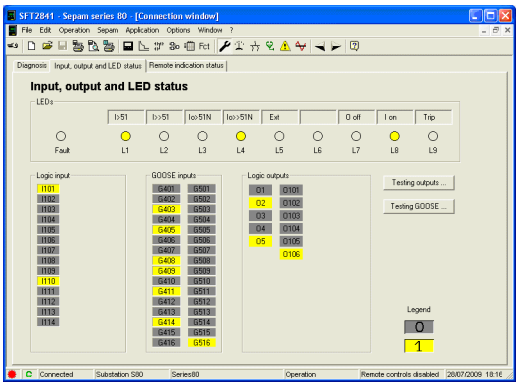
The IEC 61850 name of Sepam indications in SFT2885 software can be obtained in the Variables window (Remote indications tab)
When editing a program in the Diagram window, the IEC 61850 name of Sepam variable is also given:

- by a tool tip displayed when you point to the variable with the mouse;
- by a specific dialog box that opens when you double-click on the variable

Configuration of GOOSE communication
Testing GOOSE communication

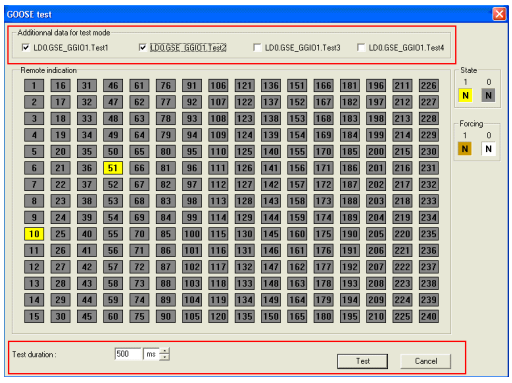
When using GOOSE communication between devices, it is important to verify that all collaborating devices have a consistent IEC 61850 configuration which ensures that each producer device sends the correct GOOSE message as expected by the receiver devices.
Sepam and SFT2841 software provide an easy way to check the GOOSE communication at installation time and at run time. The GOOSE Test function is available when SFT2841 is connected to Sepam. This function is used to:
- Display the current state of Sepam GOOSE inputs at Sepam subscriber side
- Force the emission of GOOSE messages at Sepam producer side

PE80505



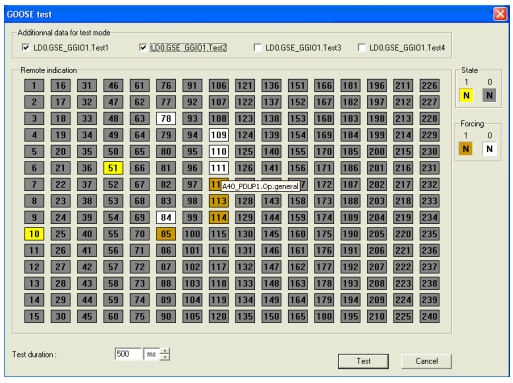
SFT2841: Sepam diagnosis Input, Output and LED status.

PE80506



SFT2841: Forcing GOOSE Test Data Objects.

PE80507



SFT2841: Forcing Sepam status.

Displaying the current state of the Sepam GOOSE inputs

Open the **Sepam diagnosis** window and select the **Input, Output and LED status** tab. The window displays the current state (0 or 1) of the 32 Sepam GOOSE Inputs: each GOOSE Input is displayed by a coloured cell with its name G401 to G416 and G501 to G516. State 0 is displayed by a grey colour cell while state 1 is displayed by a yellow colour cell.

Forcing GOOSE message emission

Forcing GOOSE message emission can be done by:
- Forcing specific GOOSE Test Data Objects
- Forcing Sepam status

Forcing specific GOOSE Test Data Objects

Sepam provides 4 specific Single Point Status Data Objects for testing GOOSE communication. These DOs are defined in GSE_GGIO1 Logical Node and are named GSE_GGIO1.Test1 to GSE_GGIO1.Test4.
Each Test DO can be added to a GOOSE Dataset and then used to trigger the emission of the GOOSE message. To check that the GOOSE message is received by the expected Sepam, the GOOSE Test DO can be attached at the Sepam subscriber side to a GOOSE input to switch-on a LED or generate a message on the Sepam front display. The GOOSE input state can be also obtained using another PC running SFT2841 software and displaying the **Input, Output and LED status** window as described above.
By default, each GOOSE Test DO is set to 0. To set manually each Test DO to 1 using SFT2841, follow the procedure below:
1. In the **Input, Output and LED status** window, click the **Testing GOOSE ...** button. The **GOOSE Test** window opens.
2. Select the Test DOs to be forced by checking the corresponding check-boxes located at the top of the window.
3. Select the forcing duration from 50 ms to 999 s in the **Test duration** list box.
4. Click the **Test** button to force the selected Test DOs for the specified forcing duration.

Forcing Sepam status

The **GOOSE Test** window includes a grid that displays the current state of 240 Single Point Status (SPS) generated by Sepam. The current state of the status is given by the cell color:
- grey means state 0
- yellow means state 1

Each cell contains the internal identifier of the Sepam SPS (from 1 to 240).
If the Sepam status corresponds to an IEC 61850 Data Object, a tool tip displays the IEC 61850 name when the mouse pointer is placed over the cell.
When some SPS are defined as member of a Dataset for GOOSE communication, you can trigger the emission of the GOOSE message by changing the state of the status.
To force the Sepam status, follow the procedure below:
1. Select the state of all the desired SPS in the grid:
   - To select state 1, click the corresponding cell once : the cell blinks orange.
   - To select state 0, click the corresponding cell twice: the cell blinks white.
   - To deselect the cell and keep the current state unchanged, click 3 times : the cell stops blinking and is colored according to the current state of the SPS.
2. Select the forcing duration from 50 ms to 999 s in the **Test duration** list box.
3. Click the **Test** button to force the selected SPS for the specified forcing duration.

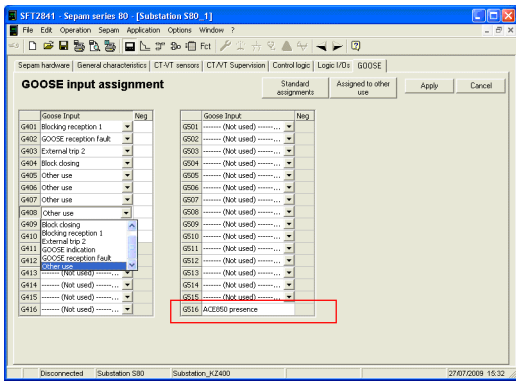
Monitoring GOOSE communication at Sepam subscriber side

Several indications are specifically available to check that GOOSE communication is fully operational at run time. All these indications can be used in any monitoring function to generate alarms or to switch-on a LED on Sepam front panel.

Check of ACE850 module presence

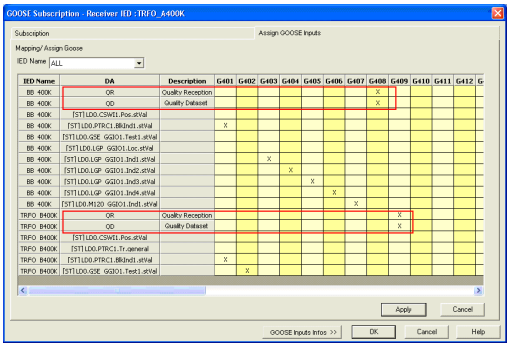
This indication is available as GOOSE input G516. It is set to 0 if ACE850 module is off-line or not installed, or not correctly defined in the Sepam series 80 hardware configuration.

PE80508



SFT2841: ACE850 presence assigned to G516.

PE80509



SFT850: assigning QR and QD attributes.

Check of GOOSE message reception

For each expected GOOSE message, 2 specific attributes QR and QD are available allowing the receiver Sepam to check that the timing and the consistency of the received GOOSE message are correct.
QR and QD attributes can be assigned to any Sepam GOOSE inputs G401-G416 and G501-516.

- QR: Quality Reception

At run time, the QR attribute is set to 1 to inform that the GOOSE message was not received in the expected time.

- QD: Dataset consistency

At run time, the QD attribute is set to 1 to inform that the structure of the received GOOSE message is not as expected at subscription time.

Conformance statements

General

This chapter describes conformity with IEC 61850. It does not describes the standard itself, but only the choices that have been made in the Sepam implementation of the standard, in terms of services, modeling, exceptions, extensions and adaptations.

The conformance statement is made up of the following documents:

- ACSI conformance statement: this document describes the abstract communication services interface (which services are implemented). These services are mapped to specific communication services (SCSM) described in the PICS.
- MICS (Model Implementation Conformance Statement): describes how the information model is implemented.
- PICS (Protocol Implementation Conformance Statement): describes choices made in protocol implementation. Many of these choices are implied by the ACSI conformance statement.
- PIXIT (Protocol Implementation eXtra Information for Testing): gives any additional implementation specific information not found in the previous standardized documents. Despite the name, these informations are useful for operation of the devices.
- TICS (Technical Issues Conformance Statement): describes how the device behaves regarding identified technical issues.

ACSI
*The **A**bstract **C**ommunication **S**ervices **I**nterface is defined by part 7-2 of IEC 61850.*
It provides:
- *the specification of a basic information model,*
- *the specification of information exchange service models.*

These conformance statement tables are as defined by Annex A of IEC 61850-7-2.

ACSI basic conformance statement

		Client / subscriber	Server / publisher	Value / comments
Client-server roles				
B11	**Server** side (of TWO-PARTY APPLICATION-ASSOCIATION)		■	
B12	**Client** side of (TWO-PARTY APPLICATION-ASSOCIATION)			
SCSMs supported				
B21	**SCSM**: IEC 61850-8-1 used		■	
B22	**SCSM**: IEC 61850-9-1 used			
B23	**SCSM**: IEC 61850-9-2 used			
B24	**SCSM**: other			
Generic substation event model (GSE)				
B31	**Publisher** side		■	ACE850 only
B32	**Subscriber** side	■		ACE850 only
Transmission of sampled value model (SVC)				
B41	**Publisher** side			
B42	**Subscriber** side			

ACSI service conformance statement

Services		AA: TP/MC	Client / subscriber	Server / publisher	Value / comments
Server (Clause 6)					
S1	ServerDirectory	TP		■	
Application association (Clause 7)					
S2	Associate			■	
S3	Abort			■	
S4	Release			■	
Logical device (Clause 8)					
S5	LogicalDeviceDirectory	TP		■	
Logical node (Clause 9)					
S6	LogicalNodeDirectory	TP		■	
S7	GetAllDataValues	TP		■	
Data (Clause 10)					
S8	GetDataValues	TP		■	
S9	SetDataValues	TP			
S10	GetDataDirectory	TP		■	
S11	GetDataDefinition	TP		■	
Data set (Clause 11)					
S12	GetDataSetValues	TP		■	
S13	SetDataSetValues	TP			
S14	CreateDataSet	TP			
S15	DeleteDataSet	TP			
S16	GetDataSetDirectory	TP		■	
Substitution (Clause 12)					
S17	SetDataValues	TP			
Setting group control (Clause 13)					
S18	SelectActiveSG	TP		■	
S19	SelectEditSG	TP			
S20	SetSGValues	TP			
S21	ConfirmEditSGValues	TP			
S22	GetSGValues	TP			
S23	GetSGCBValues	TP		■	

Note:
AA: Application Association
TP: Two Party
MC: Multi Cast
■: *supported*

Conformance statements
ACSI conformance statement

ACSI service conformance statement (cont.)

Services		AA: TP/MC	Client / subscriber	Server / publisher	Value / comments
Reporting (Clause 14)					
Buffered Report Control Block (BRCB)					
S24	Report	TP		■	
S24-1	data-change (dchg)			■	
S24-2	quality-change (dchg)			■	
S24-3	data-update (dupd)			■	
S25	GetBRCBValues	TP		■	
S26	SetBRCBValues	TP		■	
Unbuffered Report Control Block (URCB)					
S27	Report	TP		■	ACE850 only
S27-1	data-change (dchg)			■	ACE850 only
S27-2	quality-change (qchg)			■	ACE850 only
S27-3	data-update (dupd)			■	ACE850 only
S28	GetURCBValues	TP		■	ACE850 only
S29	SetURCBValues	TP		■	ACE850 only
Logging (Clause 14)					
Log Control Block					
S30	GetLCBValues	TP			
S31	SetLCBValues	TP			
Log					
S32	QueryLogByTime	TP			
S33	QueryLogAfter	TP			
S34	GetLogStatusValues	TP			
Generic substation event model (GSE) (Clause 15)					
GOOSE Control Block					
S35	SendGOOSEMessage	MC		■	ACE850 only
S36	GetReference	TP			
S37	GetGOOSEElementNumber	TP			
S38	GetGoCBValues	TP		■	ACE850 only
S39	SetGoCBValues	TP		■	ACE850 only
GSSE Control Block					
S40	SendGSSEMessage	MC			
S41	GetReference	TP			
S42	GetGSSEElementNumber	TP			
S43	GetGsCBValues	TP			
S44	SetGsCBValues	TP			
Transmission of sampled values model (SVC) (Clause 16)					
Multicast SVC					
S45	SendMSVMessage	MC			
S46	GetMSVCBValues	TP			
S47	SetMSVCBValues	TP			
Unicast SVC					
S48	SendUSVMessage	TP			
S49	GetUSVCBValues	TP			
S50	SetUSVCBValues	TP			
Control (Clause 17)					
S51	Select	TP			
S52	SelectWithValue	TP		■	
S53	Cancel	TP		■	
S54	Operate	TP		■	
S55	CommandTermination	TP		■	without parameters
S56	TimeActivatedOperate	TP			
File transfer (Clause 20)					
S57	GetFile	TP		■	
S58	SetFile	TP			
S59	DeleteFile	TP			
S60	GetFileAttributeValues	TP		■	
Time (Clause 18)					
T1	clock resolution of internal clock (nearest value of 2^{-n} in seconds)				class T1
T2	Time accuracy of internal clock				
T3	Supported TimeStamp resolution (nearest value of 2^{-n} in seconds)				class T1

Note:
AA: Application Association
TP: Two Party
MC: Multi Cast
■*: supported*

ACSI model conformance statement

		Client / subscriber	Server / publisher	Value / comments
If server side (B11) supported				
M1	Logical device		■	
M2	Logical node		■	
M3	Data		■	
M4	Data set		■	
M5	Substitution			
M6	Setting group control		■	Active SG only
M7	Buffered report control		■	
M7-1	sequence-number		■	
M7-2	report- time-stamp		■	
M7-3	reason-for-inclusion		■	
M7-4	data-set-name		■	
M7-5	data-reference		■	
M7-6	buffer-overflow		■	
M7-7	EntryId		■	
M7-8	BufTm		■	
M7-9	IntgPd		■	
M7-10	GI		■	
M7-11	Conf revision		■	
M8	Unbuffered report control		■	ACE850 only
M8-1	sequence-number		■	ACE850 only
M8-2	report- time-stamp		■	ACE850 only
M8-3	reason-for-inclusion		■	ACE850 only
M8-4	data-set-name		■	ACE850 only
M8-5	data-reference		■	ACE850 only
M8-6	BufTm		■	ACE850 only
M8-7	IntgPd		■	ACE850 only
M8-8	GI		■	ACE850 only
M8-9	Conf revision		■	ACE850 only
M9	Log Control			
M9-1	IntgPd			
M10	Log			
M11	Control		■	
If GSE (B31/B32) supported				
M12	GOOSE	■	■	ACE850 only
M13	GSSE			
If SVC (B41/B42) supported				
M14	Multicast SVC			
M15	Unicast SVC			
Other				
M16	Time		■	
M17	File Transfer		■	

Note:
■: *supported*

Conformance statements
MICS - Model implementation conformance statement

The information model is defined by parts 7-3 and 7-4 of IEC 61850.
It provides:
- *the specification of the Logical Nodes used to model substation devices and functions,*
- *the specification of Common Data Classes and Common Data Attribute Classes used in the Logical Nodes.*

Model conformance

The Model conformance of each particular Sepam device is described by its ICD file. The following descriptions are general descriptions that apply to all Sepam devices.

Common data attributes classes

The following tables list which fields is found in each Common Data Attribute Class (CDAC). Fields not found in these tables are optional (O) or conditional (C) fields not supported by Sepam devices. Mandatory fields (M) are always present.

Quality

Attribute name	Attribute type	Value/Value range	M/O/C	Comments
validity	CODED ENUM	good | invalid | questionable	M	Supported
detailQual	PACKED LIST		M	Supported
overflow	BOOLEAN	DEFAULT : FALSE	M	Defaulted
outOfRange	BOOLEAN	TRUE | FALSE	M	Supported
badReference	BOOLEAN	TRUE | FALSE	M	Supported
oscillatory	BOOLEAN	DEFAULT : FALSE	M	Defaulted
failure	BOOLEAN	TRUE | FALSE	M	Supported
oldData	BOOLEAN	DEFAULT : FALSE	M	Defaulted
inconsistent	BOOLEAN	TRUE | FALSE	M	Supported
inaccurate	BOOLEAN	TRUE | FALSE	M	Supported
source	CODED ENUM	process | substituted DEFAULT : process	M	Defaulted
test	BOOLEAN	DEFAULT : FALSE	M	Defaulted
operatorBlocked	BOOLEAN	DEFAULT : FALSE	M	Defaulted

Analogue value

Attribute name	Attribute type	Value/Value range	M/O/C
f	FLOAT32	floating point value	C

Configuration of analogue value

Common data attribute class not supported.

Range configuration

Common data attribute class not supported.

Step position with transient indication

Common data attribute class not supported.

Pulse configuration

Common data attribute class not supported.

Originator

Attribute name	Attribute type	Value/Value range	M/O/C
orCat	ENUMERATED	See IEC 61850-7-3	M
orIdent	OCTET STRING64		M

Unit definition

Common data attribute class not supported.

CtxInt

Context specific integer. The type depends on the data object.
For Mod, Beh, Health, PhyHealth, EEHealth and AutoRecSt data objects, the type is ENUMERATED, otherwise, the type is INT32.

Note:
M: mandatory field
O: optional field
C: conditional field

Vector definition

Attribute name	Attribute type	Value/Value range	M/O/C
mag	AnalogueValue		M
ang	AnalogueValue		O

Point definition

Common data attribute class not supported.

CtlModels definition

Attribute value	Comment
status-only	not controllable SPC, DPC and INC
direct-with-normal-security	controllable SPC and INC
direct-with-enhanced-security	not supported
sbo-with-normal-security	not supported
sbo-with-enhanced-security	controllable DPC

SboClasses definition

Attribute value	Comment
operate-once	
operate-many	not supported

Common data classes

The following tables list which attributes is found in each Common Data Class (CDC). Attributes not found in these tables are optional (O) or conditional (C) attributes not supported by Sepam devices. Mandatory attributes (M) are always present.

Single point status (SPS)

Attribute name	Attribute type	FC	M/O/C	Comments
stVal	BOOLEAN	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
dataNs	VISIBLE STRING255	EX	C	for non standard data objects

Double point status (DPS)

Common data class not supported.

Integer status (INS)

Attribute name	Attribute type	FC	M/O/C	Comments
stVal	CtxInt	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
dataNs	VISIBLE STRING255	EX	C	for non standard data objects

Protection activation information (ACT)

Attribute name	Attribute type	FC	M/O/C	Comments
general	BOOLEAN	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	

Note:
M: mandatory field
O: optional field
C: conditional field

Directional protection activation information (ACD)

Attribute name	Attribute type	FC	M/O/C	Comments
general	BOOLEAN	ST	M	
dirGeneral	ENUMERATED	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	

Security violation counting (SEC)

Common data class not supported.

Binary counter reading (BCR)

Attribute name	Attribute type	FC	M/O/C	Comments
actVal	INT128	ST	M	The range of such variables never exceeds 32 bits. They are therefore transmitted as INT32 values (as allowed by ASN.1 rules).
q	Quality	ST	M	
t	TimeStamp	ST	M	
units	Unit	CF	O	read-only
pulsQty	FLOAT32	CF	M	read-only

Measured value (MV)

Attribute name	Attribute type	FC	M/O/C	Comments
mag	AnalogueValue	MX	M	
q	Quality	MX	M	
t	TimeStamp	MX	M	
db	INT32U	CF	O	read-only
dataNs	VISIBLE STRING255	EX	C	for non standard data objects

Complex measured value (CMV)

Attribute name	Attribute type	FC	M/O/C	Comments
cVal	Vector	MX	M	
q	Quality	MX	M	
t	TimeStamp	MX	M	
db	INT32U	CF	O	read-only

Sampled value (SMV)

Common data class not supported.

WYE

Data name	Data class	FC	M/O/C	Comments
phsA	CMV		C	
phsB	CMV		C	
phsC	CMV		C	
neut	CMV		C	
res	CMV		C	
dataNs	VISIBLE STRING255	EX	C	for non standard data objects

Delta (DEL)

Data name	Data class	FC	M/O/C	Comments
phsAB	CMV		C	
phsBC	CMV		C	
phsCA	CMV		C	

Note:
M: mandatory field
O: optional field
C: conditional field

Sequence (SEQ)

Data name	Data class	FC	M/O/C	Comments
c1	CMV		M	
c2	CMV		M	
c2	CMV		M	

Harmonic value (HMV)

Common data class not supported.

Harmonic value for WYE (HWYE)

Common data class not supported.

Harmonic value for DEL (HDEL)

Common data class not supported.

Controllable single point (SPC)

Attribute name	Attribute type	FC	M/O/C	Comments
ctlVal	BOOLEAN	CO	C	
stVal	BOOLEAN	ST	C	
q	Quality	ST	C	
t	TimeStamp	ST	C	
ctlModel	CtlModels	CF	C	read-only
dataNs	VISIBLE STRING255	EX	C	for non standard data objects

Controllable double point (DPC)

Attribute name	Attribute type	FC	M/O/C	Comments
ctlVal	BOOLEAN	CO	C	
stVal	CODED ENUM	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
ctlModel	CtlModels	CF	C	read-only

Controllable integer status (INC)

Attribute name	Attribute type	FC	M/O/C	Comments
ctlVal	CtxInt	CO	C	
stVal	CtxInt	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
ctlModel	CtlModels	CF	C	read-only

Binary controlled step position information (BSC)

Common data class not supported.

Integer controlled step position information (ISC)

Common data class not supported.

Controllable analog set point information (APC)

Common data class not supported.

Single point setting (SPG)

Common data class not supported.

Note:
M: mandatory field
O: optional field
C: conditional field

Integer status setting (ING)

Common data class not supported.

Analogue setting (ASG)

Common data class not supported.

Setting curve (CURVE)

Common data class not supported.

Device name plate (DPL)

Attribute name	Attribute type	FC	M/O/C	Comments
vendor	VISIBLE STRING255	DC	M	
model	VISIBLE STRING255	DC	O	
location	VISIBLE STRING255	DC	O	

Logical node name plate (LPL)

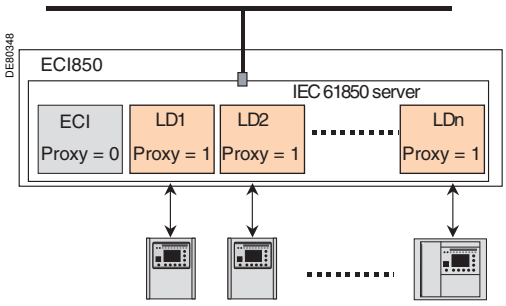
Attribute name	Attribute type	FC	M/O/C	Comments
vendor	VISIBLE STRING255	DC	M	
swRev	VISIBLE STRING255	DC	M	
d	VISIBLE STRING255	DC	M	
configRev	VISIBLE STRING255	DC	C	LLN0 only
ldNs	VISIBLE STRING255	EX	C	LLN0 only

Curve shape description (CSD)

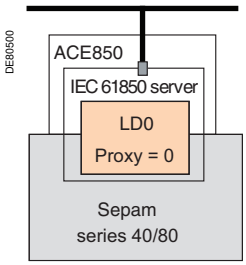
Common data class not supported.

Note:
M: mandatory field
O: optional field
C: conditional field

Conformance statements
MICS - Model implementation conformance statement



ECI850 logical devices.



ACE850 logical device.

Logical device

ECI850

The IEC 61850 server inside the ECI850 contains the following logical devices:
■ A logical device dedicated to the ECI850 unit itself. This logical device contains only LLN0 and LPHD logical nodes.
■ A logical device for each Sepam unit connected to the ECI850.The content of this logical device is defined by the Sepam type, as described by its ICD file.
The PROXY attribute of the LPHD logical node is set to TRUE for Sepam logical devices.

ECI850 logical devices

The name of the logical devices is freely assigned at configuration time, using SFT2841 or SFT850 tools, except for the ECI850 logical device which has a fixed name of "ECI".

ACE850 logical device

ACE850 is a communication accessory. It is not modelled in the IEC 61850 Sepam server. A single logical device is used for each Sepam (fixed name LD0).
The content of this logical device is defined by the Sepam type, as described by its ICD file.

Logical nodes

The following tables list possible attributes in Logical Node (LN).
Attributes not found in these tables are optional (O) or conditional (C) attributes not supported by Sepam devices. Mandatory attributes (M) are always present. Sepam devices also use extension attributes (E) for some LNs.
Logical nodes not found in this description are not supported.

System logical nodes: L group

Physical device information (LPHD class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	ECI850	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	LPHD1		M	■	■	■	■
PhyName	DPL	Physical device name plate		M	■	■	■	■
PhyHealth	INS	Physical device health		M	■	■	■	■
Proxy	SPS	Indicates if this LN is a proxy		M	■	■	■	■
PwrSupAlm	SPS	Power supply alarm		O				■

Logical node zero (LLN0 class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	ECI850	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	LLN0		M	■	■	■	■
Common logical node information								
Mod	INC	Mode		M	■	■	■	■
Beh	INS	Behaviour		M	■	■	■	■
Health	INS	Health		M	■	■	■	■
NamPlt	LPL	Name plate		M	■	■	■	■
Loc	SPS	Local operation		O		■	■	■
Controls								
LEDRs	SPC	LED reset (reset Sepam)	■	O		■	■	■
ComWac	SPC	Communication monitoring		E		■ (≥ V09xx)	■ (≥ V7.0)	
Status information								
CTFlt	SPS	CTs fault		E			■	■
VTFlt	SPS	VTs fault		E			■	■
ComFlt	SPS	Communication fault (TS240)		E				■ (≥ V6.0)

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Logical nodes for protection functions: P group

Differential protections (PDIF class)

87T - Transformer differential

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A87T_PDIF1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Op	ACT	Operate	■	M			■
Measured values							
DifAClc	WYE	Differential Current		O			■
RstA	WYE	Restraint Current		O			■

87M - Machine differential

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A87M_PDIF1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Op	ACT	Operate	■	M			■
Measured values							
DifAClc	WYE	Differential Current		O			■
RstA	WYE	Restraint Current		O			■

64REF - Restricted earth fault differential

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A64RF_PDIF1, A64RF_PDIF2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Op	ACT	Operate	■	M			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes for protection functions: P group (cont.)

Distance protections (PDIS class)

21B - Underimpedance							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A21B_PDIS1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

Directional overpower (PDOP class)

32P - Directional active overpower							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A32P_PDOP1		M		■	
		A32P_PDOP1, A32P_PDOP2		M			■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Str	ACD	Start		M		■	■
Op	ACT	Operate	■	M		■	■

32Q - Directional reactive overpower							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A32Q_PDOP1		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Str	ACD	Start		M		■	■
Op	ACT	Operate	■	M		■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes for protection functions: P group (cont.)

Directional underpower (PDUP class)

37P - Directional active underpower							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A37P_PDUP1, A37P_PDUP2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

40 - Field loss							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A40_PDUP1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

Rate of change of frequency (PFRC class)

81R - Rate of change of frequency							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A81R_PFRC1		M	■		
		A81R_PFRC1, A81R_PFRC2		M			■
Common logical node information							
Mod	INC	Mode		M	■		■
Beh	INS	Behaviour		M	■		■
Health	INS	Health		M	■		■
NamPlt	LPL	Name plate		M	■		■
Status information							
Str	ACD	Start		M	■		■
Op	ACT	Operate	■	M	■		■

Ground detector (PHIZ class)

27TN/64G2 - Third harmonic undervoltage							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A64G2_PHIZ1, A64G2_PHIZ2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Logical nodes for protection functions: P group (cont.)

Instantaneous overcurrent (PIOC class)

50/27 - Inadvertent energizing							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A5027_PIOC1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							■
Op	ACT	Operate	■	M			■

Motor restart inhibition (PMRI class)

66 - Starts per hour							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A66_PMRI1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
StrInh	SPS	Restart inhibited		O	■	■	■
StrInhTmm	INS	Restart inhibition time		O	■	■	■
NumStr	INS	Number of starts before inhibition		E	■	■	■

Motor starting time supervision (PMSS class)

48/51LR - Excessive starting time, locked rotor							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A51LR_PMSS1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Measured Values							
StrAmp	MV	Starting current		E	■	■	■
Status information							
Op	ACT	Operate	■	O	■	■	■
StrTmms	INS	Starting time		E	■	■	■

Phase angle measuring (PPAM class)

78PS - Pole slip							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A78PS_PPAM1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes for protection functions: P group (cont.)

Protection trip conditioning (PTRC class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	PTRC1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Tr	ACT	Trip		C	■	■	■
ExTr1	SPS	External Trip 1		E		■	■
ExTr2	SPS	External Trip 2		E		■	■
ExTr3	SPS	External Trip 3		E		■	■
BlkInd1	SPS	Block indication 1 sent (Logic discrimination)		E	■	■	■
BlkInd2	SPS	Block indication 2 sent (Logic discrimination)		E		■	■

Time overcurrent (PTOC class)

50/51 - Phase overcurrent

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A51_PTOC1 to A51_PTOC4		M	■	■	
		A51_PTOC1 to A51_PTOC8		M			■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

50N/51N, 50G/51G - Earth fault

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A51N_PTOC1 to A51N_PTOC4		M	■	■	
		A51N_PTOC1 to A51N_PTOC8		M			■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Logical nodes for protection functions: P group (cont.)

Time overcurrent (PTOC class) (cont.)

46 - Negative sequence/unbalance

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A46_PTOC1		M	■	■	
		A46_PTOC1, A46_PTOC2		M			■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

46BC - Broken conductor

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	46BC_PTOC1		M		■	
Common logical node information							
Mod	INC	Mode		M		■	
Beh	INS	Behaviour		M		■	
Health	INS	Health		M		■	
NamPlt	LPL	Name plate		M		■	
Status information							
Str	ACD	Start		M		■	
Op	ACT	Operate	■	M		■	
Measured values							
MaxImbNgA	MV	Maximum value of negative sequence/positive sequence current ratio		E		■	

51C - Capacitor bank unbalance

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A51C_PTOC1 to A51C_PTOC8		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

67 - Directional phase overcurrent

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A67_PTOC1, A67_PTOC2		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Str	ACD	Start		M		■	■
Op	ACT	Operate	■	M		■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes for protection functions: P group (cont.)

Time overcurrent (PTOC class) (cont.)

67N/67NC - Directional earth fault

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A67N_PTOC1, A67N_PTOC2		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Str	ACD	Start		M		■	■
Op	ACT	Operate	■	M		■	■

Overfrequency (PTOF class)

81H - Overfrequency

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A81H_PTOF1		M	■		
		A81H_PTOF1, A81H_PTOF2		M		■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

Overvoltage (PTOV class)

59 - Overvoltage (L-L or L-N)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A59_PTOV1, A59_PTOV2		M	■	■	
		A59_PTOV1 to A59_PTOV4		M			■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

59N - Neutral voltage displacement

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A59N_PTOV1, A59N_PTOV2		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes for protection functions: P group (cont.)

Overvoltage (PTOV class) (cont.)

47 - Negative sequence overvoltage

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A47_PTOV1		M		■	
		A47_PTOV1, A47_PTOV2		M			■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Str	ACD	Start		M		■	■
Op	ACT	Operate	■	M		■	■

Thermal overload (PTTR class)

49RMS - Thermal overload

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A49_PTTR1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		O	■	■	■
Measured Values							
ThmRte	MV	Thermal capacity used		E	■	■	■
Controls							
InhThmPro	SPC	Inhibit thermal protection		E	■	■	■
Status information							
Op	ACT	Operate	■	M	■	■	■
AlmThm	ACT	Thermal alarm		O	■	■	■
TmResTr	INS	Operating time before tripping		E	■	■	■
WaitTm	INS	Waiting time after tripping		E	■	■	■

38/49T - Temperature monitoring

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A49T_PTTR1 to A49TPTTR8		M	■		
		A49T_PTTR1 to A49TPTTR16		M		■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Measured Values							
Tmp	MV	Temperature for thermal load		O	■	■	■
Status information					■	■	■
Op	ACT	Operate	■	M	■	■	■
AlmThm	ACT	Thermal alarm		O	■	■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Logical nodes for protection functions: P group (cont.)

Undercurrent (PTUC class)

37 - Phase undercurrent							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A37_PTUC1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		O		■	■
Controls							
ProRs	SPC	Protection reset		E		■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

Underfrequency (PTUF class)

81L - Underfrequency							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A81L_PTUF1, A81L_PTUF2		M	■		
		A81L_PTUF1 to A81L_PTUF4		M		■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Logical nodes for protection functions: P group (cont.)

Undervoltage (PTUV class)

27- Undervoltage (L-L or L-N)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A27_PTUV1, A27_PTUV2		M	■	■	
		A27_PTUV1 to A27_PTUV4		M			■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

27D - Positive sequence undervoltage

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A27D_PTUV1, A27D_PTUV2		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start			■	■	■
Op	ACT	Operate	■	M	■	■	■

27R - Remanent undervoltage

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A27R_PTUV1		M	■	■	
		A27R_PTUV1, A27R_PTUV2		M			■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

27S - Phase to neutral undervoltage

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A27S_PTUV1		M	■		
Common logical node information							
Mod	INC	Mode		M	■		
Beh	INS	Behaviour		M	■		
Health	INS	Health		M	■		
NamPlt	LPL	Name plate		M	■		
Status information							
Str	ACD	Start		M	■		
Op1	ACT	Operate on phase A	■	M	■		
Op2	ACT	Operate on phase B	■	M	■		
Op3	ACT	Operate on phase C	■	M	■		

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Logical nodes for protection functions: P group (cont.)

Voltage controlled time overcurrent (PVOC class)

50V/51V - Voltage restrained overcurrent							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A51V_PVOC1		M		■	
		A51V_PVOC1, A51V_PVOC2		M			■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Str	ACD	Start		M		■	■
Op	ACT	Operate	■	M		■	■

Volts per Hertz (PVPH class)

24 - Overfluxing							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A24_PVPH1, A24_PVPH2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start					■
Op	ACT	Operate	■	M			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Logical nodes for protection functions: P group (cont.)

Zero speed or underspeed (PZSU class)

14 - Underspeed							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A14_PZSU1, A14_PZSU2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Measured values							
RotSpd	MV	Rotation speed		E			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

12 - Overspeed							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A12_PZSU1, A12_PZSU2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Measured values							
RotSpd	MV	Rotation speed		E			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes for protection related functions: R group

Breaker failure (RBRF class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	RBRF1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
OpEx	ACT	Breaker failure trip	■	C	■	■	■

Disturbance recorder function (RDRE class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	RDRE1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		O	■	■	■
Controls							
RcdTrg	SPC	Trig recorder		O	■	■	■
RcdInh	SPC	Inhibit recorder		E	■	■	■
Status information							
RcdMade	SPS	Recording made		M	■	■	■
FltNum	INS	Fault number (not supported, always 0)		M	■	■	■

Fault locator (RFLO class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	RFLO1		M		■	
Common logical node information							
Mod	INC	Mode		M		■	
Beh	INS	Behaviour		M		■	
Health	INS	Health		M		■	
NamPlt	LPL	Name plate		M		■	
Measured values							
FltZ	CMV	Fault impedance		M		■	
FltDiskm	MV	Fault distance		M		■	
FltPh	INS	Fault phase(s) bit 0 = 1: phase A faulty bit 1 = 1: phase B faulty bit 2 = 1: phase C faulty		E		■	

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes for protection related functions: R group (cont.)

Autoreclosing (RREC class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	RREC1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		O	■	■	■
Controls					■	■	■
BlkRec	SPC	Block reclosing		O	■	■	■
Status information							
Op	ACT	Operate	■	M	■	■	■
AutoRecSt	INS	Autoreclosing status		M	■	■	■

Synchronism-check or synchronizing (RSYN class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	RSYN1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Loc	SPS	Local operation		O			■
Measured values							
DifVClc	MV	Calculated difference in Voltage		O			■
DifHzClc	MV	Calculated difference in Frequency		O			■
DifAngClc	MV	Calculated difference of Phase Angle		O			■
Controls							
InhSynChk	SPC	Inhibit synchronism-check		E			■
Status information							
Rel	SPS	Release		M			■
VInd	SPS	Voltage difference indicator		O			■
AngInd	SPS	Angle difference indicator		O			■
HzInd	SPS	Frequency difference indicator		O			■
SynPrg	SPS	Synchronizing in progress		O			■
SynStop	SPS	Synchronizing stop	■	E			■
SynFlt	SPS	Synchronizing failure	■	E			■
Syn	SPS	Synchronizing successful	■	E			■

Logical nodes for control: C group

Switch controller (CSWI class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	CSWI1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		O	■	■	■
Controls							
Pos	DPC	Switch, general		M	■	■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes for generic reference: G group

Generic automatic process control (GAPC class)

Load shedding							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	LS_GAPC1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							■
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■
MotStrRe	SPS	Motor restart		E			■

Generic process I/O (GGIO class)

MES114 Digital Inputs							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	M114_GGIO1		M	■	■	
Common logical node information							
Mod	INC	Mode		M	■	■	
Beh	INS	Behaviour		M	■	■	
Health	INS	Health		M	■	■	
NamPlt	LPL	Name plate		M	■	■	
Status information							
Ind11 to Ind14	SPS	Digital Input I11 to I14		O	■	■	
Ind21 to Ind26	SPS	Digital Input I21 to I26		O	■	■	

MES120 Digital Inputs							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	M120_GGIOn (n = 1 to 3)		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Ind1 to Ind14	SPS	Digital Input In01 to In14 (n = 1 to 3)		O			■

Logic equations							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	EQU_GGIO1		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Ind1 to Ind8	SPS	V1 to V8		O		■	■
Ind101 to Ind108	SPS	V_MIMIC_IN_1 to V_MIMIC_IN_8		O			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes for generic reference: G group (cont.)

Generic process I/O (GGIO class) (cont.)

Logipam							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	LGP_GGIO1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Loc	SPS	Local operation		O			■
Controls							
SPCSO1 to SPCSO8	SPC	Logipam TC49 to TC56		O			■
DPCSO1	DPC	Logipam TC57/58 and TS41/42		O			■
DPCSO2	DPC	Logipam TC59/60 and TS43/44		O			■
Status information							
Ind1 to Ind8	SPS	Logipam TS33 to TS40		O			■
IntIn1 to IntIn8	INS	Logipam counter C1 to C8		O			■

GOOSE monitoring							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	GSE_GGIO1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
G401 to G416	SPS	Value of Sepam virtual inputs G401 to G416		E			■
G501 to G515	SPS	Value of Sepam virtual inputs G501 to G515		E			■
Test1 to Test4	SPS	Value of GOOSE test data Test1 to Test4		E			■

Sepam series 80 customized applications/remote indications							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	S80RI_GGIO1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
TS1 to TS64	SPS	Sepam remote indication TS1 to TS64		E			■

Sepam series 80 customized applications/Logipam counters							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	S80CT_GGIO1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
C1 to C24	SPS	Logipam counters C1 to C24		E			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Logical nodes for generic reference: G group (cont.)

Generic process I/O (GGIO class) (cont.)

Sepam series 80 customized applications/remote controls (first group)							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	S80RC_GGIO1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Loc	SPS	Local operation		O			■
Controls							
TC1 to TC32	SPC	Remote controls TC1 to TC32		E			■

Sepam series 80 customized applications/remote controls (second group)							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	S80RC_GGIO2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Loc	SPS	Local operation		O			■
Controls							
TC33 to TC64	SPC	Remote controls TC33 to TC64		E			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Logical nodes for metering and measurement: M group

Non phase related harmonics (MHAN class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	MHAN1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Measured values							
Hz	MV	Basic frequency		C			■
ThdAmp	MV	Current total harmonic distortion		O			■
ThdVol	MV	Voltage total harmonic distortion		O			■

Metering (MMTR class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	MMTR1 (Internal energy counters)		M		■	■
		MMTR2 (External energy counters)		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Measured values							
SupWh	BCR	Real energy supply		O		■	■
SupVArh	BCR	Reactive energy supply		O		■	■
DmdWh	BCR	Real energy demand		O		■	■
DmdVArh	BCR	Reactive energy demand		O		■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Logical nodes for metering and measurement: M group (cont.)

Measurement (MMXU class)

Main channels measurements (for Sepam series 40 and Sepam series 80)							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	MMXU1		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Measured values							
TotW	MV	Total active power		O		■	■
TotVAr	MV	Total reactive power		O		■	■
TotVA	MV	Total apparent power		O		■	■
TotPF	MV	Average power factor		O		■	■
Hz	MV	Frequency		O		■	■
PPV	DEL	Phase to phase voltages		O		■	■
PhV	WYE	Phase to ground voltages		O		■	■
A	WYE	Phase currents		O		■	■
W	WYE	Phase active power		O			■
VAr	WYE	Phase reactive power		O			■
VA	WYE	Phase apparent power		O			■

Current channels measurements for Sepam series 20 and Sepam series 80 (additional channels)							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	MMXU2		M	■		■
Common logical node information							
Mod	INC	Mode		M	■		■
Beh	INS	Behaviour		M	■		■
Health	INS	Health		M	■		■
NamPlt	LPL	Name plate		M	■		■
Measured values							
A	WYE	Phase currents		O	■		■

Voltage channels measurements for Sepam series 20 (B2x applications) and Sepam series 80 (additional channels)							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	MMXU3		M	■		■
Common logical node information							
Mod	INC	Mode		M	■		■
Beh	INS	Behaviour		M	■		■
Health	INS	Health		M	■		■
NamPlt	LPL	Name plate		M	■		■
Measured values							
Hz	MV	Frequency		O	■		■
PPV	DEL	Phase to phase voltages		O	■		■
PhV	WYE	Phase to ground voltages		O	■		■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Logical nodes for metering and measurement: M group (cont.)

Sequence and imbalance (MSQI class)

Main channels measurements							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	MSQI1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Measured values							
SeqV	SEQ	Positive, negative and zero sequence voltage		C	■ (1)	■	■

(1) *negative sequence voltage not available on Sepam series 20*

Additional voltage channels measurements							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	MSQI2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Measured values							
SeqV	SEQ	Positive, negative and zero sequence voltage		C			■

Metering statistics (MSTA class)

Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	MSTA1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		O	■	■	■
Metered values							
Max W	MV	Maximum real power		O		■	■
MaxVAr	MV	Maximum reactive power		O		■	■
AvAmps1	MV	Average current phase A		O	■	■	■
AvAmps2	MV	Average current phase B		O	■	■	■
AvAmps3	MV	Average current phase C		O	■	■	■
MaxAmps1	MV	Maximum current phase A		O	■	■	■
MaxAmps2	MV	Maximum current phase B		O	■	■	■
MaxAmps3	MV	Maximum current phase C		O	■	■	■
TrAmp1	MV	Last trip current phase A		E	■	■	■
TrAmp2	MV	Last trip current phase B		E	■	■	■
TrAmp3	MV	Last trip current phase C		E	■	■	■
TrAmp4	MV	Last trip current neutral		E	■	■	■
Controls							
RsMaxA	SPC	Reset peak demand current		E			■
RsMaxPwr	SPC	Reset peak demand power		E			■
RsMax	SPC	Reset peak demand values		E	■	■	

Note:
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O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
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Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Logical nodes for sensors and monitoring: S group

Insulation medium supervision (liquid) (SIML class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	SIML1		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
InsAlm	SPS	Insulation liquid critical (=Buchholz alarm)		M		■	■
GasInsTr	SPS	Buchholz trip		O		■	■
PresAlm	SPS	Pressure alarm		O		■	■
PresTr	SPS	Pressure trip		O		■	■
TmpAlm	SPS	Thermostat alarm		O		■	■
TmpTr	SPS	Thermostat trip		E		■	■
ThmAlm	SPS	Thermistor alarm		E		■	■
ThmTr	SPS	Thermistor trip		E		■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
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Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Logical nodes for switchgear: X group

Circuit breaker (XCBR class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	XCBR1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		M	■	■	■
EEHealth	INS	External equipment health		O	■	■	■
OpCnt	INS	Operation counter		M	■	■	■
Controls							
Pos	DPC	Switch position		M	■	■	■
BlkOpn	SPC	Block opening		M	■	■	■
BlkCls	SPC	Block closing		M	■	■	■
Metered values							
SumSwARs	BCR	Sum of switched amperes		O	■	■	■
Status information							
CBOpCap	INS	Circuit breaker operating capability		M	■	■	■
OpHrsCnt	INS	Operating hours counter		E	■	■	■
OpTmms	INS	Operating time		E	■	■	■
ChaTms	INS	Charging time		E	■	■	■
PhFltCnt	INS	Phase faults trip counter		E			■
EFTrCnt	INS	Earth faults trip counter		E			■
SumSwAAlm	SPS	Cumulative breaking current alarm		E			■
CBRkdOut	SPS	Circuit breaker racked out		E			■
RkdOutCnt	INS	Racking out operations counter		E			■
ESwPos	SPS	Earthing switch position		E			■

Logical nodes for further power system equipment: Z group

Capacitor bank (ZCAP class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	ZCAP1 to ZCAP4		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Loc	SPS	Local operation		O			■
EEHealth	INS	External equipment health		O			■
OpTmh	INS	Operation time		O			■
Controls							
CapDS	SPC	Capacitor bank device status		M			■
Status information							
DschBlk	SPS	Blocked due to discharge		M			■
Auto	SPS	Automatic operation		E			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.
The transient attribute will be deprecated in edition 2 of the IEC 61850 standard (to be released soon).
Starting with version V1.4, the Sepam ICD files library is provided with this attribute always set to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes per Sepam series 20 and Sepam series 40 types

Logical Node	S20	S23	S24	T20	T23	T24	M20	B21	B22	S40	S41	S42	S43	S50	S51	S52	S53	T40	T42	T50	T52	M41	G40
System Logical Nodes - L group																							
LPHD1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
LLN0	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for protection functions - P group																							
A32P_PDOP1											■	■	■		■	■	■					■	■
A32Q_PDOP1																						■	■
A81R_PFRC1									■														
A66_PMRI1							■															■	
A51LR_PMSS1							■															■	
A46_PTOC1	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■
A46BC_PTOC1														■	■	■	■			■	■		
A51_PTOC1-4	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■
A51N_PTOC1-4	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■
A67_PTOC1-2												■				■			■		■		
A67N_PTOC1-2											■	■	■		■	■	■		■		■	■	
A81H_PTOF1/1-2								■	■	■	■	■		■	■	■		■	■	■	■	■	■
A47_PTOV1-2										■	■	■		■	■	■		■	■	■	■	■	■
A59_PTOV1-2								■	■	■	■	■		■	■	■		■	■	■	■	■	■
A59N_PTOV1-2								■	■	■	■	■		■	■	■		■	■	■	■	■	■
PTRC1	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■		■	■	■	■	■	■
A49_PTTR1				■	■	■	■											■	■	■	■	■	■
A49T_PTTR1-8/16				■	■	■	■											■	■	■	■	■	■
A37_PTUC1							■															■	
A81L_PTUF1-2/4								■	■	■	■	■		■	■	■		■	■	■	■	■	■
A27_PTUV1-2								■	■	■	■	■		■	■	■		■	■	■	■	■	■
A27D_PTUV1-2								■	■													■	
A27R_PTUV1								■	■													■	
A27S_PTUV1								■	■														
A51V_PVOC1																							■
Logical Nodes for protection related functions - R group																							
RDRE1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
RBRF1		■	■		■	■				■	■	■	■	■	■	■	■	■	■	■	■	■	■
RFLO1														■	■	■	■						
RREC1	■	■	■							■	■	■	■	■	■	■	■						
Logical Nodes for control - C group																							
CSWI1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for generic reference - G group																							
EQU_GGIO1										■	■	■	■	■	■	■	■	■	■	■	■	■	■
M114_GGIO1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for metering and measurement - M group																							
MMTR1-2										■	■	■	■	■	■	■	■	■	■	■	■	■	■
MMXU1										■	■	■	■	■	■	■	■	■	■	■	■	■	■
MMXU2	■	■	■	■	■	■	■																
MMXU3								■	■														
MSQI1								■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
MSTA1	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for sensors and monitoring - S group																							
SIML1																		■	■	■	■		
Logical Nodes for switchgear- X group																							
XCBR1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Conformance statements
MICS - Model implementation conformance statement

Logical nodes per Sepam series 80 types

Logical Node	S80	S81	S82	S84	T81	T82	T87	M81	M87	M88	G82	G87	G88	B80	B83	C86
System Logical Nodes - L group																
LPHD1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
LLN0	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for protection functions - P group																
A64RF_PDIF1-2					■	■	■				■		■			
A87M_PDIF1									■			■				
A87T_PDIF1							■			■			■			
A21B_PDIS1											■	■	■			
A32P_PDOP1-2		■	■	■	■	■	■	■	■	■	■	■	■			
A32Q_PDOP1								■	■	■	■	■	■			
A37P_PDUP1-2				■							■					
A40_PDUP1								■	■	■	■	■	■			
A81R_PFRC1-2				■												
A64G2_PHIZ1-2											■	■	■			
A5027_PIOC1											■	■	■			
A66_PMRI1								■	■	■						
A51LR_PMSS1								■	■	■						
A78PS_PPAM1								■	■	■	■	■	■			
A46_PTOC1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A51_PTOC1-8	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A51C_PTOC1-8																■
A51N_PTOC1-8	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A67_PTOC1-2			■	■		■	■				■	■	■			
A67N_PTOC1-2		■	■	■	■	■	■	■	■	■	■	■	■			
A81H_PTOF1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A47_PTOV1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A59_PTOV1-4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A59N_PTOV1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
PTRC1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A49_PTTR1		■	■	■	■	■	■	■	■	■	■	■	■			■
A49T_PTTR1-16					■	■	■	■	■	■	■	■	■			■
A37_PTUC1								■	■	■						
A81L_PTUF1-4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A27_PTUV1-4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A27D_PTUV1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A27R_PTUV1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A51V_PVOC1-2											■	■	■			
A24_PVPH1-2							■				■	■	■			
A12_PZSU1-2								■	■	■	■	■	■			
A14_PZSU1-2								■	■	■	■	■	■			
Logical Nodes for protection related functions - R group																
RBRF1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
RDRE1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
RREC1	■	■	■	■												
RSYN1	■	■	■	■	■	■	■				■	■	■	■	■	
Logical Nodes for control - C group																
CSWI1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for generic reference - G group																
LS_GAPC1								■	■	■						
EQU_GGIO1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
LGP_GGIO1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
M120_GGIO1-3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for metering and measurement - M group																
MHAN1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
MMTR1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
MMXU1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
MMXU2							■		■	■		■	■			
MMXU3															■	
MSQI1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
MSQI2															■	
MSTA1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes sensors and monitoring - S group																
SIML1					■	■	■	■		■	■		■			
Logical Nodes switchgear - X group																
XCBR1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for further power equipment - Z group																
ZCAP1-4																■

Conformance statements
PICS - Protocol implementation conformance statement

*The **Specific Communication Services Mapping** to MMS (ISO 9506) and to ISO/IEC 8802-3 is defined by part 8-1 of IEC 61850.*
It provides:
■ *the mapping of the objects and services of the ACSI to MMS*
■ *the mapping of time-critical information exchanges to ISO/IEC 8802-3*
These conformance tables are taken from chapter 24 of IEC 61850-8-1.

Profile conformance

A-Profile support

Profile		Client	Server	Comments
A1	Client/server		■	
A2	GOOSE/GSE Management	■	■	ACE850 only
A3	GSSE			
A4	Time sync	■		

T-Profile support

Profile		Client	Server	Comments
T1	TCP/IP profile		■	
T2	OSI T profile			
T3	GOOSE/GSE T profile	■	■	ACE850 only
T4	GSSE T profile			
T5	Time Sync T profile	■		

MMS conformance

MMS service supported CBB (server)	M/O/C/I	Supported
status	M	■
getNameList	C	■
identify	M	■
rename	O	
read	C	■
write	C	■
getVariableAccessAttributes	C	■
defineNamedVariable	O	
defineScatteredAccess	I	
getScatteredAccessAttibutes	I	
deleteVariableAccess	O	
defineNamedVariableList	O	
getNamedVariablesListAttributes	C	■
deleteNamedVariableList	C	
defineNamedType	I	
getNamedTypeAttributes	I	
deleteNamedType	I	
input	I	
output	I	
takeControl	I	
relinquishControl	I	
defineSemaphore	I	
deleteSemaphore	I	
reportPoolSemaphoreStatus	I	
reportSemaphoreStatus	I	
initialDownloadSequence	I	
downloadSegment	I	
terminateDownloadSequence	I	
initiateUploadSequence	I	
uploadSegment	I	
terminateUploadSequence	I	
requestDomainDownload	I	
requestDomainUpload	I	
loadDomainContent	I	
storeDomainContent	I	
deleteDomain	I	
getDomainAttributes	C	■

Note:
M: mandatory support
O: optional support
C: conditional support
I: out of scope
X: must not be supported (version compatibility)

MMS conformance (cont'd)

MMS service supported CBB (server)	M/O/C/I	Supported
createProgramInvocation	I	
deleteProgramInvocation	I	
start	I	
stop	I	
resume	I	
reset	I	
kill	I	
getProgramInvocationAttributes	I	
obtainFile	C	
defineEventCondition	I	
deleteEventCondition	I	
getEventConditionAttributes	I	
reportEventConditionStatus	I	
alterEventConditionMonitoring	I	
triggerEvent	I	
defineEventAction	I	
deleteEventAction	I	
alterEventEnrollment	I	
reportEventEnrollmentStatus	I	
getEventEnrollmentAttributes	I	
acknowledgeEventNotification	I	
getAlarmSummary	I	
getAlarmEnrollmentSummary	I	
readJournal	C	
writeJournal	O	
initializeJournal	C	
reportJournalStatus	I	
createJournal	I	
deleteJournal	I	
fileOpen	C	■
fileRead	C	■
fileClose	C	■
fileRename	I	
fileDelete	C	
fileDirectory	C	■
unsolicitedStatus	I	
informationReport	C	■
eventNotification	I	
attachToEventCondition	I	
attachToSemaphore	I	
conclude	M	■
cancel	M	■
getDataExchangeAttributes	X	
exchangeData	X	
defineAccessControlList	X	
getAccessControlListAttributes	X	
reportAccessControlledObjects	X	
deleteAccessControlList	X	
alterAccessControl	X	
reconfigureProgramInvocation	X	

Note:
M: mandatory support
O: optional support
C: conditional support
I: out of scope
X: must not be supported (version compatibility)

Conformance statements
PICS - Protocol implementation conformance statement

GOOSE services (Sepam series 80 only)

GOOSE conformance	Subscriber		Publisher	
	M/O/C	Supported	M/O/C	Supported
GOOSE services	C	■ (ACE850 only)	C	■ (ACE850 only)
SendGOOSEMessage	M		M	■
GetGoReference	O		C	
GetGOOSEElementNumber	O		C	
GetGoCBValues	O		O	
SetGoCBValues	O		O	
GOOSE Control Block (GoCB)	O		O	■

GSSE conformance	Subscriber		Publisher	
	M/O/C	Supported	M/O/C	Supported
GSSE services	C		C	
SendGSSEMessage	M		M	
GetGsReference	O		C	
GetGSSEDataOffset	O		C	
GetGsCBValues	O		O	
SetGsCBValues	O		O	
GSSE Control Block (GsCB)	O		O	

SCL services

SCL conformance			
		M/O/C	Supported
SCL.1	SCL file for implementation available (offline)	M	■
SCL.2	SCL file available from implementation online	O	
SCL.3	SCL implementation reconfiguration supported online	O	

Note:
M: mandatory support
O: optional support
C: conditional support
I: out of scope
X: must not be supported (version compatibility)

Conformance statements
PIXIT - Protocol implementation extra information for testing

Device configuration

The entire device configuration is read-only and can only be modified by the CID file. In particular, data objects with functional constraints of DC and CF can never be written.

ACSI models

Association model

Item	Value/Comments
Maximum simultaneous client associations	6
TCP Keepalive	1 to 60 seconds (default 30) (1)
Authentication	Not supported
Association parameters	
TSEL	Required, value defined in the CID file
SSEL	Required, value defined in the CID file
PSEL	Required, value defined in the CID file
AP-Title	Not required, ignored if present
AE-Qualifier	Not required, ignored if present
Maximum MMS PDU size	8000
Typical startup time after a power supply interrupt	ECI850: 20-100 seconds (depends on the CID configuration file). The status LED blinks quickly during startup.
	ACE850: 5-30 seconds (depends on the CID configuration file). The On/fault LED blinks quickly during startup.

(1) *This is the time between two keepalive probes during normal operation. The session time-out, in case of communication failure, is related to this value in a non-linear way and ranges from approximately 50 seconds to approximately 150 seconds. It is about 90 seconds for the default keepalive value.*

Note: *A 3 second delay between each association is required.*

Server model

Item	Value/Comments
Quality bits for analog values (MX)	
Validity	Good, Invalid
OutofRange	Supported
Failure	Supported
Inconsistent	Supported
Source	Process
Other quality bits and values	Not supported
Quality bits for status values (ST)	
Validity	Good, Invalid
BadReference	Supported
Failure	Supported
Inconsistent	Supported
Inaccurate	Supported
Source	Process
Other quality bits and values	Not supported
Maximum number of data values in Get/SetDataValues requests	Limited only by the MMS PDU size

Setting group model

Item	Value/Comments
Number of setting groups	2

Note: *Setting group is used to globally switch Sepam between A and B parameter sets, so no individual "SG" feature is provided.*

Dataset model

Item	Value/Comments
Predefined Datasets in the ICD files	■ 1 status Dataset **LLN0.StDs** ■ 1 measurand Dataset **LLN0.MxDs** in each Sepam Logical Device
Maximum number of data elements in one Dataset	No fixed limit, it depends on the available memory.
Maximum number of persistent Datasets	No fixed limit, it depends on the available memory.
Maximum number of non-persistent Datasets	Not supported

Conformance statements
PIXIT - Protocol implementation extra information for testing

Reporting model

Item	Value/Comments
Predefined BRCBs in the ICD files	■ 2 status RCBs **LLN0.brcbST01** and **LLN0.brcbST02**, based on **LLN0.StDs** ■ 2 measurands RCBs **LLN0.brcbMX01** and **LLN0.brcbMX02**, based on **LLN0.StMx** in each Sepam Logical Device
Predefined URCBs in the ICD files	None
Support of trigger conditions	
Integrity	Supported
Data change	Supported
Data update	Supported (can be set, but there is no process data to report for this condition)
Quality change	Supported
General interrogation	Supported
Support of optional fields	
Sequence number	Supported
Report time-stamp	Supported
Reason for inclusion	Supported
Dataset name	Supported
Data reference	Supported
Buffer overflow	Supported
EntryID	Supported
Conf-rev	Supported
Segmentation	Supported, automatic
Sending of segmented reports	Supported
EntryID	Only the first 4 octets are used. Remaining octets must be 0.
Buffer size for each BRCB	30000 octets
URCB management	URCB instances are created dynamically from the models, for each client requesting it.

Control model

Item	Value/Comments
Control models supported	
Status only	Supported
Direct with normal security	Supported
Direct with enhanced security	Not supported
SBO with normal security	Not supported
SBO with enhanced security	Supported
Time activated operate (operTm)	Not supported
Test mode	Not supported, ignored
Check conditions	Not supported, must be 0
Operate many	Not supported
Pulse configuration	Not supported
Command Termination timeout	15 seconds
Service error types	■ instance-not-available ■ access-violation ■ parameter-value-inappropriate ■ instance-locked-by-another-client ■ failed-due-to-server-constraint ■ generic-error

SBO controls

ctlNum normally must have the same value in the Select and Operate requests.
To insure interoperability with older clients not complying with this rule, the value plus one is also accepted in the Operate request.
It is possible to select several times the same control object. The select/operate timeout is restarted with each selection. The value contained in the Cancel structure is ignored. Controls with same ctlVal as current status are accepted.

GOOSE model (Sepam series 80 with ACE850)

Item	Value/Comments
GOOSE header subscriber identification	
Source Mac Address	Supported
Destination Mac Address	Not Supported
VPID tag (VLAN, priority)	Supported, optional field
Ethertype = 0x88B8	Supported
APPID	Supported
Length	Supported
gocbRef	Supported
timeAllowedtoLive	Supported
datSet	Supported
goID	Supported, optional field
t	Not Supported
stNum	Supported
sqNum	Not Supported
test	Supported
confRev	Supported
ndsCom	Not Supported, must be FALSE
numDatSetEntries	Supported
GOOSE publish can be turned ON/OFF	Supported, using SetGoCBValues(GoEna)
GOOSE publish mode test turned ON/OFF	Supported, using the Diagnostics Web pages
Incorrect GOOSE publish configuration	Not supported, configurator does not validate it.
Missing GOOSE detection	Supported, QR condition is set on timeout.
Syntactically incorrect GOOSE frame	Supported, QD condition is set on bad syntax.
Subscribed GOOSE is out-of-order	Supported, partially for stNum, not for sqNum
Subscribed GOOSE is duplicated	Supported, the frame is ignored.
GOOSE data contents	
Structured data objects	Supported
Data attributes	Supported
timestamp data attributes	Supported
GOOSE VLAN capability	
GOOSE with VLAN tag	Supported
GOOSE without VLAN tag	Supported
Retransmission time profile	Supported, configuration from 4 ms to 30 s TAL min = 200 ms, plus 1 lost frame tolerance

GOOSE Publisher detailed behavior

■ Test mode:

The test mode of a GOOSE can be set or reset using a check-box in the "GOOSE messaging statistics" web page.

■ Transmission profile:

□ On any change the GOOSE frame is first transmitted as soon as possible, and then retransmitted according to the time profile, from MinTime to MaxTime.

□ Time profile follows the powers of 2 in milliseconds, bounded to 29900 ms.

□ MinTime and MaxTime are configurable and truncated to the nearest convenient value of the profile, in the range from 4ms to 29900 ms.

■ Time-Allowed-to-Live:

It is the sum of the 2 next retransmission times.

The minimum is 150 ms, plus 50 ms to allow at least a 1-frame loss tolerance.

Conformance statements
PIXIT - Protocol implementation extra information for testing

GOOSE Subscriber detailed behavior

A received GOOSE frame is considered if it matches the following configured criteria:

■ Ethernet protocol:

□ If the Optional VLAN tag exists, it must have the form 0x8100xxxx.

□ The protocol identifier must be GOOSE = 0x88B8.

■ GOOSE protocol:

□ Received frame is large enough to contain specified data length.

□ Destination address is the one of the subscribed GOOSE.

□ All the fields are checked for consistency in the following order: APPID, Length, gocbRef, TAL, datSet, optional goID, t, stNum, sqNum, test, confRev, ndsComm, and Data fields. ndsComm must have the value FALSE.

■ GOOSE data consistency:

□ The datSet structure matches the expected one versus ASN.1 coding types.

□ If it does not match, the Quality of Data flag (QD) is set.

■ GOOSE timeout:

□ If a frame does not match any above criteria, it is rejected as invalid.

□ If no valid frame is received before the Time-Allowed-to-Live timeout, plus 50ms, the Quality of Reception flag (QR) is set.

□ On invalid frame, data is left to last known valid values.

■ GOOSE data validity:

□ stNum must be higher or lower than the previous one to prevent from frame overtaking during a network reconfiguration, and to allow resynchronization with a producer that has desynchronized. If the new value is lower, the difference between these 2 values must be more than 1.

□ sqNum is not checked to prevent deadlocks with a desynchronized producer.

□ t field is not checked, devices may be not time-synchronized.

□ Test mode: when the test mode is set in the GOOSE header, the values are not considered, and previous values are frozen as valid until the test mode is reset, however QD and QR conditions are still evaluated.

A valid received GOOSE is decoded for Sepam series 80 as follows:

■ Each IEC 61850 data is converted in a 1-bit value using rules:

□ Single Point Status: "true" = 1, "FALSE" = 0.

□ Double Point Status: "10" = 1, all other combinations = 0.

□ Quality: "bad" = 1, "good" = 0, with the following rules:

If INVALID: mask "I" is applied on detailQual (default 0xF8).
If QUESTIONABLE: mask "Q" is applied on detailQual (default 0x77).
Mask "M" is applied on the source, test, operatorBlocked bits (default 0x03).
If any of these gives 1 or QR condition is present, the quality is set to "bad".

□ Any other data type gives a 0 value.

■ Each of resulting 1-bit values may be assigned to zero, one, or more of the 31 dedicated GOOSE inputs, as virtual digital inputs for Sepam series 80 (GSE_GGIO1 logical node):

□ The 31 virtual GOOSE inputs are G401 to G416, and G501 to G515.

□ G516 is reserved for the ACE850 module presence detection.

□ A GOOSE input not having any assignment is let to 0.

□ Several 1-bit values may be assigned to one GOOSE input: an OR is assumed.

Conformance statements
PIXIT - Protocol implementation extra information for testing

Time and time synchronization model

Item	Value/Comments
Time quality bits	
LeapSecondsKnown	Supported but not used
ClockFailure	Supported
ClockNotSynchronized	Supported
Maximum time to wait for time server responses	5 seconds
Meaning of ClockFailure bit	This bit is set when it is not possible to get time from any time server (or when the SNTP synchronization is not enabled).
Meaning of ClockNotSynchronized bit	This bit is set when the time server sets the alarm condition (clock not synchronized) in the SNTP frame (LI field).

Time stamps

Time stamping is performed in Sepam devices for process status values such as protection tripping, digital inputs changes…
It is performed in the ECI850 or ACE850 for any other data such as deadbanded analog values.

ECI850 or ACE850 clock

At power-up, the ECI850 or ACE850 clock is reset to 2007/01/01 00:00.000. It is then synchronized to the SNTP servers if the feature is enabled and the servers are running. Sepam units are synchronized from the ECI850 or ACE850 only if the ClockFailure status is not set.

File transfer model

Item	Value/Comments
Separator for files and directories path	'/'
Structure of files and directories	ECI850: LD/LDName/COMTRADE/filename ACE850: LD/LDName/COMTRADE/filename
Maximum length of names (incl. path)	64
Case sensitivity	Case sensitive

Conformance statements
PIXIT - Protocol implementation extra information for testing

Impact of Sepam settings

Logical device mode
Provided that the Sepam unit is of the correct type and communicates correctly with the ECI850 or ACE850, the corresponding logical device mode (given by LLN0.Mod) is always ON. The only exception is when a Sepam series 80 device is set in "test mode" in which case it is reported as BLOCKED (the closest IEC 61850 mode).

Protection logical nodes
Protection logical nodes are OFF (**Mod** attribute), if the corresponding protection function is turned OFF in the Sepam unit.
Some Protection Logical Nodes require a mandatory **Str** (Start) attribute. Such an information being unavailable in Sepam devices, it is always provided as an OFF state and invalid quality.

Breaker-related Logical Nodes
Breaker-related logical nodes CSWI1 and XCBR1 rely on the breaker control function being turned ON in the Sepam device.

Setting groups
IEC 61850 setting group 1 corresponds to Sepam setting group A.
IEC 61850 setting group 2 corresponds to Sepam setting group B.
Selection of active setting group is only possible if "Choice (of setting group) by remote control" is selected on the Sepam device.

Controls
In order to be executed, controls must be enabled in the Sepam unit. This is the case if the **Loc** attribute (available in every logical node containing controls) is OFF. In addition, with ECI850, SBO mode must be turned OFF on the Modbus interface.

Analog values

Measurements

Units
Measurements are provided as floating point values with the following units:

Measurement type	Units
Current	1 A
Voltage	1 V
Power	1 kW, 1 kVA, 1 kvar
Energy	1 MWh, 1 Mvarh
Temperature	1 °C
Angle	1 °
Rate	1 %
Rotation speed	1 rpm
Power factor	1

Deadbands
Default deadband values are provided in the CID file. These values can be changed.
Unlike specified in IEC 61850-7-3, deadband values are not expressed as % but they are integer values in physical units, which are described in the CID file.
The deadband for the "ang" attribute of items belonging to the "vector" type is fixed at 5°.

Integer statuses
Integer statuses are transmitted with the following units:

Logical Node	Attribute	Sepam series 20	Sepam series 40	Sepam series 80
A66_PMRI1	StrInhTmm	1 min	1 min	1 min
A51LR_PMSS1	StrTmms	100 ms	100 ms	10 ms
A49_PTTR1	TmResTr	1 min	1 min	1 min
A49_PTTR1	WaitTm	1 min	1 min	1 min
XCBR1	OpHrsCnt	1 hr	1 hr	1 hr
XCBR1	OpTmms	1 ms	1 ms	1 ms
XCBR1	ChaTms	1 ms	100 ms	1 second
Miscellaneous	Counters	1	1	1

Conformance statements
TICS - Technical issues conformance statement

Introduction

Error corrections and improvements have been made to the current edition (edition 1) of the IEC 61850 standard. These items, known as technical issues or "tissues" can be found on: http://www.tissues.iec61850.com.
The UCA IUG QAP, acting as the competent body for device certification, requires that the tissue conformance statement of a device is provided.

The following tables reference only the tissues that have been accepted and solved by the editor's group in charge of them, at the time of publication.

The conformance (M/O/-) column indicates:
- M: Mandatory, tissue is included in the UCA Device conformance test procedures and stated as mandatory (interoperability).
- O: Optional, the tissue is a recommendation or it is optional in the IEC 61850 documents or it is not required for compliance to edition 1.

The supported (Sup) column indicates:
- Y: Yes, the tissue is implemented in the device.
- N: No, the tissue is not implemented in the device.
- N/A: Not applicable, the tissue is not applicable for the device.

Optional tissues are listed only if they are supported.
Some tissues are only editorial, or related to the XML schema or to a client. They have no impact on the device conformance and are therefore just listed for sake of clarity.

IEC 61850 part 6 Tissues

Editorial and schema related TISSUES are: 1, 5, 169

Number	Clause/ Subclause	Paragraph Figure/Table	Final change	M/O/-	Sup
3	Annex B		Check the ENUMs and complete the appendix: AutoRecSt, FltLoop, PmpCtl. The ICD/SCD files should include these ENUMS when used.	O	Y
8	Annex B		Use name Watts for code 62 instead of "W".	M	N/A
10	Annex A		Add the bType Check to the schema, to be used for the Check attribute.	M	Y
15			The "bufOvfl" attribute in the "ReportControl/OptFields" section of SCL should be deleted.	O	Y
17			Change restriction of DAI/SDI to make it consistent with DA/BDA restrictions. The DA/BDA explicitly allow SIUnit as an attribute starting with uppercase. Other exceptions are special CDCs created in 8-1.	M	Y

IEC 61850 part 7-2 Tissues

Editorial and schema related TISSUES are: 31, 32, 36, 45

Number	Clause/ Subclause	Paragraph Figure/Table	Final change	M/O/-	Sup
30	17.5.2.3		Control parameter T	M	Y
35	17.5.2.3	Table 36	Change T attribute type from "EntryTime" to "TimeStamp".	M	Y
37	15.2.3.1		Change T attribute type from "EntryTime" to "TimeStamp".	M	N/A
38	15.2.1 15.2.1.4		Change GoCB attribute name from "AppID" to "GoID".	M	N/A
39	15.2.1		Add Attribute "DstAddress" after the Attribute "NdsCom". "15.2.1.8 DstAddress The attribute DstAddress shall be the SCSM specific addressing information like media access address, priority, and other information."	M	N/A
40	15.2.3.1 15.2.3.3		GOOSE message syntax. Change Attribute name from "AppID" to "GoID".	M	N/A
41	15.3.1 15.3.4.1		GsCB class definition. Change Attribute name from "AppID" to "GsID".	M	N/A
42	16.4		Sampled value format. Change Attribute type from "EntryTime" to "TimeStamp".	M	N/A
43	17.5.2.3		Change "The parameter T shall be the time when the client sends the control requests. Add NOTE: "Control requests can be Select, Operate, or Cancel."	M	Y
44	17.15.2.6		Add new AddCause value: Object-not-selected (18)	M	Y
46	17.3.3	33, 34	Synchro check - Cancelling a command as long as no Oper_resp+ has been received, compare new state diagram.	O	N/A
47	19.2	Figure 40	The LDName is limited to 64 characters. '.' or '$' or other '=' are not allowed.	M	Y
49	14.2.2.16		BRCB TimeOfEntry	O	Y

IEC 61850 part 7-2 Tissues (cont.)

Editorial and schema related TISSUES are: 31, 32, 36, 45

Number	Clause/ Subclause	Paragraph Figure/Table	Final change	M/O/-	Sup
50	19.2		The LNName prefix shall start with a letter. Otherwise, mapping to MMS should restrict it, since MMS variable names are not allowed to start with a number.	M	Y
51	5.5.2	Table 2	Definition of "ARRAY [0..num] OF." type	M	N/A
52	15.2.3.6	Table 2	GOOSE StNum: starts from 1 after power-up and sqNum starts from 0	M	N/A
53	15.3.1	Tables 30, 32	Attribute DstAddress (Type: PHYCOMADDR, FC:GS) has been added to the GSSE control block.	M	N/A
151	19.2		Name constraints for control blocks etc…	M	Y
166	14.3.3.2.7		DataRef attribute in Log	M	N/A
185	14.3.3.2.7		Logging integrity period	M	N/A
189	16.4		SV Format	M	N/A
190	14.2.2.1		BRCB EntryId and TimeOfEntry	O	Y
191	14.2.2.5		BRCB: Integrity and buffering reports	M	Y
234	5.5.2		New type CtxInt	M	Y
275	14.2.3.2		Confusing statement on GI usage	M	Y
278	14.2.2.15		EntryId not valid for a server	O	Y
297	14.2.2.10		The BRCB that has report enable set to TRUE shall maintain the parameter SqNum. This number shall be incremented by the BRCB for each report generated and sent on the basis of the BRCB. The increment shall occur once the BRCB has formatted the report for transmission. The first report following the setting of the report enable to TRUE shall contain sequence number 0. The sequence number shall roll over to 0 at its maximal value.		N (see PIXIT)
335	14.2.3.2.2.8		The buffer overflow bit should only be sent on the first report after enable.		N (see PIXIT)

IEC 61850 part 7-3 Tissues

Editorial and schema related TISSUES are: 54, 55, 56, 57, 58, 59, 60, 61, 138

Number	Clause/ Subclause	Paragraph Figure/Table	Final change	M/O/-	Sup
28	7.6.2	Table 38	APC: change the FC of setMag to CO, like for all controllable CDCs (naturally also for origin and operTm). Add the attribute ctlNum with fc=CO like for other controllable CDCs. Add the attribute mag with fc=MX for the back indication from the process.	M	N/A
65	General		Deadband calculation of a vector and trigger option	M	Y
219	7.3.5		operTm in ACT	M	N/A
270	7.4.5/6		WYE and DEL RMS Values	M	Y

IEC 61850 part 7-4 Tissues

There are no mandatory TISSUES for that part.

IEC 61850 part 8-1 Tissues

Number	Clause/ Subclause	Paragraph Figure/Table	Final change	M/O/-	Sup
116			A MMS GetNameList request with a non-existing domain shall be responded by "Confirmed Error-PDU".	M	Y
118	23.1		When the last character of FileName is the file separator it is a directory. E.g. "LD\KEMA" is a file and "LD\KEMA\" is a directory.	0	Y
120	8.1.2.2		CtxInt shall be defined as a generic data type in 7-2: either as an Int32 or as an ENUMERATED depending on the context. The definition of the attributes stVal, ctlVal, subVal in the CDC INS/INC is changed from Int32 to CtxInt. In 7-4, the enumerations lead to set the CtxInt to ENUMERATED. Therefore no change required in 8-1, because ENUMERATED are already mapped. As a result ENUMERATED attributes (as e.g. stVal, ctlVal) are mapped to INT8 (not to INT32).	0	Y
165			GetDataSetValues request with a non-existent DataSet should result in an MMS ErrorResponse of Class= ACCESS and Error Code= OBJECT-NON-EXISTENT.	M	Y
183	9.3	Table 17	MMS getNamelist request with an unknown domain object reference result in an MMS ServiceError of Class= ACCESS and Error Code= OBJECT-NON-EXISTENT. Update table 17	M	Y
235	8.1.3.2		Extension of name length	M	Y

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